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AN ANALYSIS OF OFFICER PROFESSIONAL DEVELOPMENT IN THE VP (MARITIME PATROL) AVIATION COMMUNITY WITH APPLICATION OF AN INTERACTIVE COMPUTER MODEL FOR SEATOUR OPPORTUNITY DETERMINATION

Ernest Lewis Morris, Jr.

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

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by

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June 1980

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T195840

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
An Analysis of Officer Professional Development in the VP (Maritime Patrol) Aviation Community with Application of an Interactive Computer Model for Seatour Opportunity Determination

5. TYPE OF REPORT & PERIOD COVERED
Master's Thesis;
June 1980

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Ernest Lewis Morris, Jr.

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Naval Postgraduate School
Monterey, California 93940

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Naval Postgraduate School
Monterey, California

12. REPORT DATE
June 1980

13. NUMBER OF PAGES
181

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)
Naval Postgraduate School
Monterey, California

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)
Same as block No. 16.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Manpower Planning
Officer Professional Development
Interactive Computer Model
Naval Aviation Manpower Management
Manpower Modeling

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This thesis presents an analysis of officer professional development within the VP (Maritime Patrol) Aviation Community of the U. S. Navy and a VP SEATOURS model designed for use in planning for more efficient utilization of available manpower. Historical billet and career path analysis is conducted for the purpose of examining command selection probabilities, defining a common career structure, and identifying relevant parameters

20. Continued.

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by

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Lieutenant Commander, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1980

Thesis
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PREFACE

An adaptation of a similar model presented in Ref. 18, the VP SEATOURS model was developed using the APL programming language on the IBM 360 computer of the Naval Postgraduate School. This thesis was completed as part of the Research in Officer Manpower and Personnel Planning sponsored by the Principal Deputy Assistant Secretary of the Navy (Manpower and Reserve Affairs) and the Deputy Chief of Naval Operations (Manpower, Personnel, and Training, OP-01).

The model is now accessible to manpower managers in OP-01 using the APL*PLUS system of the Scientific Time Sharing Corporation. Potential users may readily familiarize themselves with the model by referring to Section VI. B. through E., Section VII. B. through E., and accompanying appendices of this thesis.

I. INTRODUCTION

Manpower management within the Department of Defense (DoD) is becoming an increasingly complex and costly endeavor, particularly during the era of an all-volunteer force. Essentially a closed personnel system with little lateral entry and with leadership and management developed within, the Defense Manpower System is constantly changing as a consequence of alterations in monetary and nonmonetary policies of the government. Such a dynamic environment routinely demandstimely, absolute, and decisive reaction to manpower problems which directly or indirectly influence defense posture.

For effective management of military manpower during the 1980's it is imperative that precise, automated methods be employed in the collection and processing of relevant data. This is critically important in the establishment of manpower requirements and determination of the most effective utilization of available resources for fulfilling defense objectives. Manpower managers must be properly equipped to provide a prompt and correct response to manpower problems and to detect trends in governing policies which require immediate attention. The ability to accurately analyze and forecast long range effects of available alternatives is a valuable, desperately needed, dimension to manpower planning within the defense establishment.

One of the most recent, perplexing problems facing manpower managers in the United States Navy is that of aviation officer management. Increased commercial airline hiring in conjunction with other factors during the late 1970's has been a major contribution to steadily decreasing retention rates among military pilots, a resource requiring extremely high training costs. If aviation manpower requirements are maintained in order to achieve currently mandated readiness levels, then development of effective utilization policies must be of immediate concern in an era of dwindling personnel resources. Declining steadily since FY 1977, pilot retention in the U. S. Navy fell to 48 percent in FY 1978, plunged to 31 percent in FY 1979, and is projected to reach 27 percent during FY 1980 [Ref: 13:47]. Low pilot retention coupled with recent pilot production shortfalls will combine to yield severe limitations in availability of junior officer aviators. Unless effective management techniques are immediately applied, the problem will continue to persist and possibly become more intense during the 1980's.

In general, manpower management techniques applied in Naval Aviation are similar in scope to those employed in other major communities of the Navy, e.g., Surface Warfare and Sub-Surface Warfare. However, each community, and particularly the aviation segment, possesses a rather unique structure necessitating specific management considerations. The aviation branch consists of a number of sub-communities requiring distinct management

attention regarding officer professional development and manpower planning. The nature of Naval Aviation requires such an approach because of the diversity of missions and types of aircraft necessary to fulfill defense objectives. Naval Aviation may be divided into six major categories, as follows: VA (attack), VF (fighter), VP (maritime patrol), VS (ASW-fixed wing), HS (ASW-helicopter), and mission support which includes (VT) training, (VAW) airborne early warning, (VX) research and development, (VQ) special mission, and (VR/VC) utility squadrons. Significant differences exist across all of these categories with manpower requirements determination largely independent, requiring each to be managed separately with regard to utilization and career development policies.

This thesis focuses on management of one segment of Naval Aviation: the VP (Maritime Patrol) community. A relatively large and extremely valuable dimension to the Naval Air Force, the VP community provides an additional element of complexity to manpower management since the officer complement consists of NFOs (Naval Flight Officers), as well as pilots. Therefore, analysis dealing with VP officer professional development must address both of these officer categories, even though each group may have somewhat differing assignments and billet requirements.

Definition of the most prevalent career paths followed by VP officers can be helpful in analyzing professional development in this particular aviation community. Incorporation of

historical career path analysis with considerations for future manpower utilization, concentrating more on desired product rather than just "filling slots," may prove beneficial in establishment of viable policies which more effectively employ scarce manpower resources.

The purpose of this thesis is to analyze manpower management within the VP community by focusing on officer professional development and thereby establishing relevant criteria for appropriate input parameters for the subsequent application of a VP Seatour Opportunity Model. After a description of aviation officer professional development, the analysis will first explore historical billet structure and VP career paths. Information derived from this analysis will provide a basis from which to define parameters used in the VP Seatour Opportunity Model which is designed to assist manpower managers in planning VP officer distribution and utilization. With the ability to "test" alternative manpower policies through use of an interactive computer model, VP manpower managers may be able to detect immediately trends in resource employment which require intelligent alterations in current policy affecting manpower distribution within the VP aviation community, specifically, and the Navy, in general.

II. AVIATION OFFICER PROFESSIONAL DEVELOPMENT

Officer professional development and career management are extremely complicated and demanding tasks involving a concerted effort on the part of manpower managers to properly match individuals with organizational requirements. The concept of career management can be viewed from the individual perspective of developing his or her own life pattern of work or from the organizational perspective of creating a well-defined career path for personnel to follow [Ref: 5: 325-349]. Individuals must identify major goals and interim objectives to become competent managers of their own careers. Organizations must assume responsibility for assisting individuals in career management by providing detailed information regarding alternatives and sequences of jobs which may be undertaken to enhance opportunity for achieving career success, as well as meeting organizational goals. As a plan for establishment of priorities for effective management of manpower resources, officer professional development is essential in an effort to provide and maintain a knowledgeable and competent officer corps capable of supplying the leadership required in an increasingly complex naval environment.

Defining the best career development path for affording necessary experience and expertise is a difficult task involving the need to match individual desires with organizational objectives. Requisite training, rank restrictions, tour dependencies, and tour sequencing are all major constraints on

career development of unrestricted line (URL) officers and significantly complicate the distribution and assignment process. There are basically three phases of attaining professional excellence as an URL officer [Ref: 10: vii].

1. Warfare qualification and fundamental operational experience (grade of ensign through lieutenant).
2. Attainment of qualification for command-at-sea (grade of lieutenant commander through mid-grade commander).
3. Command-at-sea or ashore - the major goal (mid-grade commander through captain).

In each of the above phases the requirement for operational excellence is repeated, the necessity of attaining and reinforcing subspecialty development is emphasized, and individual growth in managerial roles is stressed [Ref: 10:5]. The cornerstone of career development, therefore, is intended to be the establishment of operational expertise in a specific warfare specialty, such as aviation, surface, or sub-surface. However, it is equally important to provide an opportunity for qualified officers to pursue concentrated development in secondary, subspecialty fields. The OTMS (Operational Technical Managerial System) has been employed since 1972 in an effort to provide such opportunity and broaden the scope of URL career development.

Establishment of a viable aviation professional development path for meeting individual needs as well as fulfilling requirements for competent, skillfully trained officers is a

comprehensive problem that must be solved in an aggressive, intelligent manner, particularly during an era of aviation manpower shortages. Manpower managers must attempt to meet individual career objectives to the greatest extent possible while also ensuring that sufficient, properly trained officers are available to fill mission requirements. Assignment priorities must be established using all available manpower planning tools and methods.

It is paramount for every young aviator to have the opportunity to spend a major portion of his career flying operational aircraft, the task for which he was initially trained and possibly a primary reason for his entry into the Navy. Nevertheless, there are numerous shore and sea positions not involving flying which must be filled by qualified naval aviators. When aviation manpower shortages occur, fleet billet requirements obviously take precedence. As a consequence, shore billets are out of necessity "gapped" or not filled at all. As in any manpower system, increasing personnel shortages not only place a considerable burden upon manpower managers but also upon the remaining constituents who may be forced to alter career objectives in order to fulfill organizational needs. Naval Aviation's current manpower crisis has reached a level where significant steps must immediately be taken to increase retention, reduce requirements, and/or discover alternative sources of personnel. A recent URL Officer Study has explored and

recommended methods of improving the current aviation manpower situation [Ref: 13].

Since there is considerable variability in billet requirements and career paths within Naval Aviation, an analysis of officer professional development should commence at the subcommunity level. The VP (Maritime Patrol) community offers a unique professional development path with emphasis on two major divisions of aviation officer manpower: pilots and NFOs (Naval Flight Officers). Although their respective career paths are currently much more similar thanin the recent past, some minor differences continue to exist. It was not until the early 1970's that NFOs were able to compete on an equal basis with pilots for VP squadron command positions.

Professional development of VP officers must include an efficient balance of operational sea tours (flying and non-flying) to develop required operational expertise and shore assignments for the establishment and utilization of technical or sub-specialty endeavors. The primary objective is to provide officers fully capable of commanding VP squadrons at sea and fulfilling demanding technical and managerial positions ashore. Figure 1 illustrates the professional development path of aviators, as found in the Unrestricted Line Officer Career Guidebook [Ref: 10:44]. Caution must be observed in interpretation of the career path depicted because it represents only a very general guideline to the structure of the VP officer's

career. As a result of constantly changing manpower policies and requirements revisions, individuals may have many options available in some cases and, therefore, do not exactly follow the path outlined.

Analysis of the entire VP aviation community, or a substantial portion thereof, may provide insight as to whether VP officer's are receiving duty assignments which provide experience levels essential for development of future commanding officers. Recent trends in assignment policy indicate focus on filling voids in the training command and fleet replacement squadrons (FRS). This emphasis on flying billets may cause a considerable number of aviators to forego opportunities for ship assignments and sub-specialty development. Analysis of the billet structure and career paths within the VP community also assists in delineating specific constraints affecting VP manpower management and provides a firm basis for development of a manpower planning model.

AVIATION OFFICER PROFESSIONAL DEVELOPMENT PATH

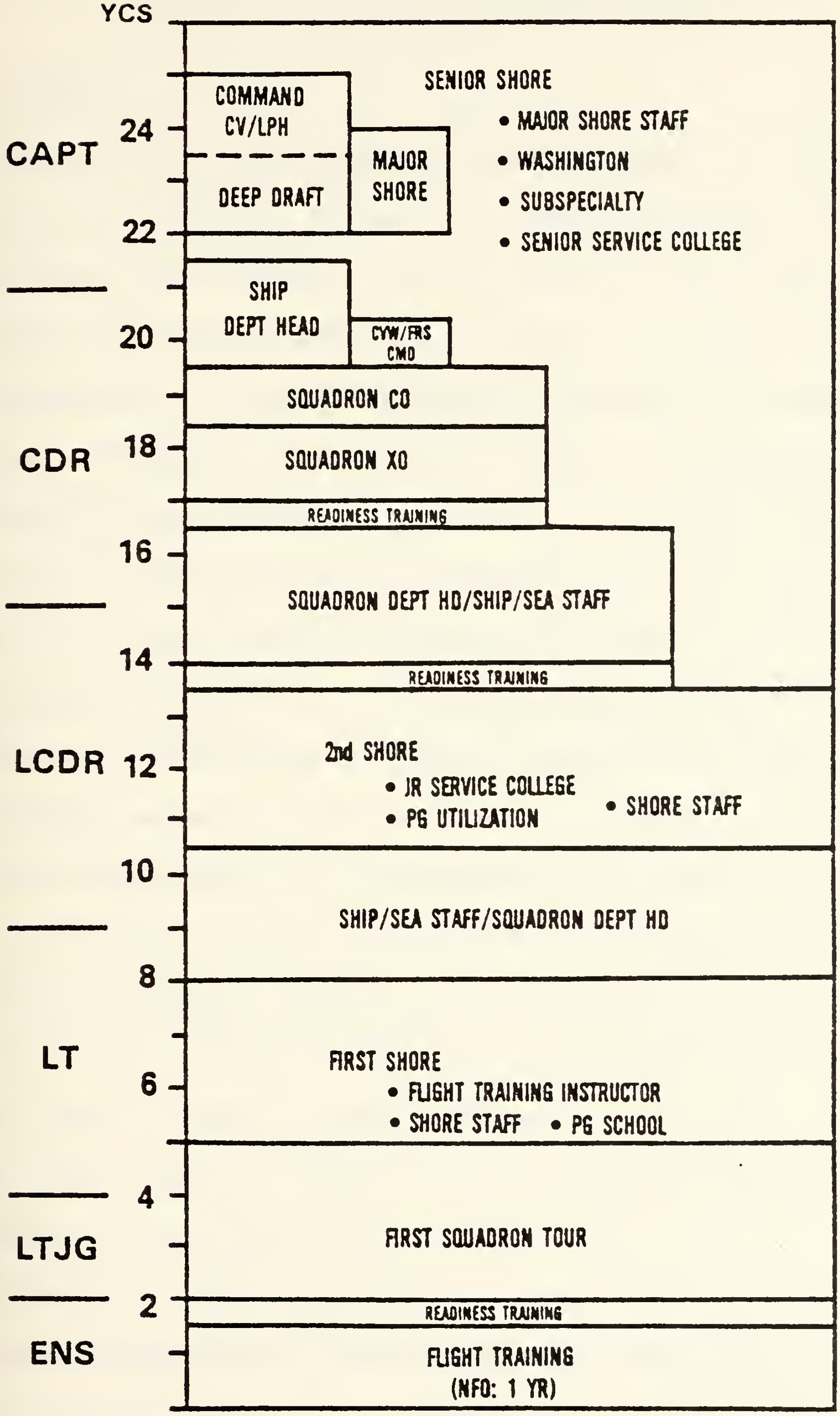

Figure 1.

III. HISTORICAL BILLET ANALYSIS

A. PURPOSE

Analysis of historical billet assignments of VP officers is useful in defining career structure and detecting trends in professional development. Additionally, this method proves valuable in identification of the type of billets being assigned, the frequency of these assignments, and who is filling specific billets. Frequency distribution analysis of billet assignments at certain time periods of a career is helpful in defining tours which are significant in the effective professional development of the VP officer corps. Crucial assignments may be recognized as necessary flowpoints in a career path for enhancing individual professional development, thereby leading to increased promotion and command selection opportunities. Specific billets may be examined separately or in combinations to establish a career path structure. When the objective is to develop a manpower model for a specific warfare community, historical billet analysis proves to be a beneficial method for definition of model parameters, such as billet types, billet requirements, tour dependency, and timing of certain tours commonly associated with the specific warfare community.

Historical billet analysis conducted in this research concentrates primarily on the professional development path leading to VP squadron command. Consequently, the structure of analysis

requires an examination of approximately the first 15 years of a VP officer's career from service entry through the command screening point. Therefore, command screening serves as a convenient and useful criterion for comparison of VP pilot and NFO career development.

B. DATA

The data employed in this research was extracted from Navy Personnel Research and Development Center (NPRDC) Officer Master File data tapes. This source included records of all officer personnel on active duty as of November 1979. VP pilots and NFOs in year groups '57 through '65 were randomly selected from the file to form the specific sample for analysis. Table 1 gives a summary of this sample with computed selection/nonselection proportions.

For each individual in the sample the following information was extracted:

Rank	(present grade)
Promotion Status	(select or fail to select for next higher grade)
Year Group	(current year group)
Designator	(current warfare specialty designator)
Source Code	(Commissioning source)
ACBD	(Active Commission Base Date)
Command Selection Status	(Year of selection, primary/ alternate, and type of squadron)

Current Billet (Billet presently assigned)

Promotion History Dates (Dates of promotion to each grade)

Billet History (Eight most recent duty assignments with respective Navy Officer Billet Codes (NOBC), Ship/Station Identification Codes (SSIC), and reporting/detaching dates)

Appendix A includes a sample of the format used to display the above information. Initial inspection of this data revealed that gaps prevailed in duty assignments for a considerable number of cases. Further analysis determined that professional training (i.e., Naval War College, Armed Forces Staff College, etc.), postgraduate education, and some postgraduate utilization tours were not included in the duty assignment listings for each case. Consequently, additional information specifically targeting these crucial tours had to be extracted from the Officer Master File to complete the billet histories of individuals having completed such tours. Also included in Appendix A is a sample format of the additional information required to fully reconstruct the billet histories of all VP officers in the sample.

The year group restriction of '57 through '65 was established for two important reasons. First of all, records of a considerable number of cases in year groups prior to '57 were not complete since only the most recent eight tours were included in the data, thereby making it impossible to reconstruct the early portions of their careers. Secondly, VP aviators subsequent to

Table 1

SUMMARY OF VP OFFICER SAMPLE

	Pilots	NFOs	Totals (aggregate)
Available Records (YGS '57 through '65)	533	249	782
Number of Command Selectees	220	79	299
Selectee Records Coded and Analyzed	150 (.68)	62 (.78)	212 (.71)
Number of Command Nonselectees	313	170	483
Nonselectees Records Coded and Analyzed	150 (.48)	100 (.59)	250 (.52)
Command Selection Proportion	.41	.32	.38

Note. The percentages included in parentheses represent the proportion of records analyzed from the available group of selectees or nonselectees.

year group '65 had not as yet been fully considered for command selection. At the same time, all information concerning billet history and command screening was available for year groups '57 through '65.

A major limitation of the data is the fact that attrition information is not taken into account. Therefore, the analysis centers only upon "due course" officers who have advanced through the command screening "window" and have been selected or not selected for command of a VP operational or miscellaneous squadron. As a matter of current policy, VP officers normally enter the command screening "window" at year group plus thirteen years of commissioned service and are eligible for selection during a three year period [Ref: 11:14].

C. METHODOLOGY

Interpretation of the Officer Master File data required extensive application of Navy Officer Manpower and Personnel Classifications Volume I (Major Code Structure) and Volume II (The Officer Data Card) (NAVPERS 15839D) [Refs: 19 and 20]. These publications explicitly define each of the numerous categories and codes included in the Officer Master File. The sections of these references found to be the most useful are included in Appendix B.

The process of defining a billet history for each officer in the sample began with a review of the individual record to

ensure there were no existing gaps. Initially, 18 separate billet categories were established and a billet code assigned to each: 11 shore billets and 7 sea billets. Table 2 includes a listing of these categories with definitions describing each. Although considerable aggregation could have been applied, the initial objective was to keep the billet categories as specific and mutually exclusive as possible to preclude major interpretation problems on billet precedence.

Table 2

AVIATION BILLET CATEGORIES

SHORE BILLETS (11)

S1 - STAFF - D.C.

Any shore staff tour in the Washington,D.C., area not specifically designated as a postgraduate utilization tour.

S2 - STAFF - OTHER

Any shore staff tour not involving postgraduate utilization, assignment in the Washington,D.C., area, or warfare specialty related duties. This category additionally includes overseas staff shore duty.

S3 - STAFF - WARFARE SPECIALTY RELATED

Any shore staff tour specifically involving duties related to aviation warfare specialty. This category can include tours on major staffs such as NAVAIRLANT, NAVAIRPAC, and PATWINGS.

I1 - INSTRUCTOR DUTY - FLEET REPLACEMENT SQUADRON (FRS)

Any tour in a major fleet replacement squadron, such as VP-30 or VP-31 for the VP community.

I2 - INSTRUCTOR DUTY - NAVAL AVIATION TRAINING COMMAND

Any tour in a flight training squadron.

Table 2 (Continued)

I3 - INSTRUCTOR DUTY - NAVAL ACADEMY/NROTC/PROFESSIONAL SCHOOLS

Any instructor tour at the Naval Academy, an NROTC unit, or the Naval War College, etc.

P1 - GRADUATE LEVEL EDUCATION

Any tour involving graduate level education leading to a MA/MS or Ph.D. degree.

P2 - SERVICE COLLEGE EDUCATION

Any tour as a student at the Naval War College, Armed Forces Staff College, or other similar professional school.

U1 - SUBSPECIALTY UTILIZATION

Any tour involving utilization of previously obtained postgraduate education. This tour designation takes precedence when any other billet category is concurrent.

R1 - RECRUITING COMMAND

Any tour involving assignment to recruiting duties.

T0 - INITAL FLIGHT TRAINING

The initial flight training tour.

SEA BILLETS (7)

F1 - FIRST OPERATIONAL SQUADRON TOUR

Initial operational squadron assignment.

F2 - SECOND SQUADRON TOUR

Any squadron assignment after the first operational tour but not including the VP department head tour. This tour could include any "disassociated" squadron assignment.

F3 - THIRD SQUADRON TOUR

Any squadron assignment after the first operational tour and second squadron tour but not including the VP department head tour.

Table 2 (Continued)

D1 - DEPARTMENT HEAD TOUR

The VP department head tour which is normally the second operational flying tour.

B1 - SEA DUTY - STAFF

Any tour that involves assignment to a seagoing staff such as a CARGRU or CRUDESGRU staff.

B2 - SEA DUTY - SHIP'S COMPANY

Any tour involving assignment to a ship's company billet such as navigator, CIC officer, TSC officer, hanger deck officer, etc.

B3 - SEA DUTY - OTHER

Any tour involving overseas sea duty assignments or remote shore tours considered to count as sea duty. This may include certain TSC, NAVFAC, and overseas NAS assignments.

The billet history of each officer in the sample was analyzed tour by tour. For each tour position the corresponding NOBC (Navy Officer Billet Code) was referenced to determine the specific duties performed in that tour. A determination was then made for assignment of the most appropriate billet category code for that particular tour. In some cases a considerable amount of interpretation was required in selection of the billet category code applicable to the tour being considered. The most frequent conflict arose in instances where an individual may have had a shore staff tour which was also considered a postgraduate education utilization tour. In that case, since postgraduate utilization was considered to have precedence, the tour would be assigned a billet category code of U1.

For each of the 462 officers sampled billet category codes were assigned, tour by tour, and recorded in a separate data file. Each record commenced with the tour the individual was in at the time last considered for command. This tour position was designated TOUR1. Each preceding tour was then recorded until the entire career had been coded with the last assigned code representing the tour immediately following service entry. This tour was normally the flight training assignment. Appendix C provides a sample format of some of the cases in this new data file. Each case represents the individual's career, as defined by billet category codes, from service entry to the command screening point. Additional information included in this file consists of case numbers, selection or nonselection codes, source codes, flight hours attained, and codes depicting the last billet held in the department head assignment.

The new data file was subdivided into four major categories:

pilot selectees
pilot nonselectees
NFO selectees
NFO nonselectees

A frequency distribution program developed using methods outlined in the Statistical Package for the Social Sciences [Ref:9] was then applied using respective data for each of the above groups to ascertain a career structure which represents the most prevalent billet categories occurring at certain tour

positions (TOUR 1 through TOUR 8). Additionally, commissioning source and billets held in the department head tour were compared among all four groups. Conditional probabilities involving specific tours were also calculated to define the impact of these tours on opportunity for command selection. The results of this analysis phase are compared with information included in a recent memorandum from the senior member of the fiscal 1980 Aviation Command Screen Board [Ref:3].

D. FINDINGS

1. Frequency Distribution Analysis

Frequency distribution analysis provided a means for determination of the most prevalent billet categories occurring in specific tour positions (TOUR 1 through TOUR 8). Table 3 exhibits the results of this method for the four officer groups analyzed. Billet categories delineated under each tour position heading represent billets which occurred in at least 10 percent of the cases for that specific tour. The remaining, less frequent categories were truncated. Each billet category is listed by relative frequency for each tour position with percentage of occurrence adjacent in parentheses. It is essential to point out that the information presented in Table 3 does not directly reflect career paths, although such information can be utilized as a basis for development of career patterns, as will be illustrated in Section IV.

Table 3

Frequency Distribution of Billet Categories

	TOUR1	TOUR2	TOUR3	TOUR4	TOUR5	TOUR6	TOUR7	TOUR8
Pilot Selectees (150 cases)	S3(.22) S2(.14) S1(.13) U1(.12) P2(.11)	D1(.55) P2(.21)	D1(.23) P2(.21) B2(.16)	B2(.22) P1(.13) D1(.11)	F1(.23) P1(.19) I2(.13) I1(.11)	F1(.49) T0(.21)	T0(.52) F1(.20)	T0(.20)
Pilot Nonselectees (150 cases)	S3(.25) S2(.17) D1(.14) S1(.12) U1(.11)	D1(.43)	D1(.22) B2(.21) S3(.11) P2(.10)	B2(.25) D1(.14) I2(.11)	F1(.25) I2(.18) P1(.14) I1(.11)	F1(.53) T0(.23)	T0(.54) F1(.17)	T0(.17)
NFO Selectees (62 cases)	S3(.31) D1(.19) S1(.15)	D1(.45) P2(.23)	D1(.24) P2(.19)	S3(.18) B3(.13) B2(.11)	F1(.16) I1(.15) S3(.13) F2(.11) S2(.11)	F1(.34) T0(.16) F2(.11)	F1(.40) T0(.32)	T0(.42)
NFO Nonselectees (100 cases)	D1(.25) S3(.20) S2(.14)	D1(.40) P2(.11) B3(.10) S2(.10) S3(.10)	S3(.22) B3(.14) D1(.13)	D1(.16) S3(.16) B3(.14) B2(.12)	S3(.18) F1(.16) F2(.10) I1(.10)	F1(.58) T0(.16)	T0(.59) F1(.17)	T0(.17)

Note. The percentages in parentheses represent the frequency of occurrence of each billet in specific tour positions.

The results are useful in identification of the billet types most frequently undertaken, at what time frames they prevail in the career structure, and who is most likely to have completed them. For example, the most prevalent billet in the TOUR 1 position for three of the four groups analyzed is the S3 shore staff billet. By far the most common at the TOUR 2 and 3 level, the department head tour (D1) additionally exists over a wider range of tour positions. It is also apparent that service college education (P2), prevailing in TOURS 2 and 3, is more frequent among pilot and NFO selectees than nonselectees.

Such information may also imply underlying timing aspects which may prove significant for certain billet categories. For example, although heavily concentrated in TOUR positions 2 and 3, the department head billet maintains a large proportion in the TOUR 1 position for nonselectees, possibly indicating that having this billet at a later point in the career may not necessarily prove enhancing to selection opportunities. Perhaps confirming the 1980 Aviation Command Screen Board (ACSB) report that getting into the department head tour too early could be detrimental to command screening [Ref:3], the data reflect a large proportion of nonselectees having such a tour in the relatively early TOUR 4 position.

Further evaluation of the department head billet was considered relevant since it is currently believed to be the single most important factor in the screening process [Ref:3]. Table 4 includes a summary of the frequency of specific assignments held

while in the department head tour. For pilot selectees, the operations and maintenance officer positions were by far the most common. Pilots having served primarily as safety or administrative officers or who had never attained a major department head position seemed less likely to be selected for command. For all nonselectees a more evenly distributed range of department head positions was evident with a considerably large percentage never having served as a major department head.

For NFO selectees there was evidence of heavy concentration on the operations officer position and a relatively large percentage having administrative officer positions or no major department at all. In general, the data reveal that operations and maintenance officer positions may be enhancing and that failure to attain at least one of the four major department head positions while in the department head tour may in fact be detrimental to command selection opportunities.

The most significant commissioning sources of selectees and nonselectees are presented in Table 5. Naval Academy graduates were a major source of pilot command selectees, but likewise represented a substantial percentage of nonselectees in addition to Aviation Officer Candidates. For NFOs, those officers having participated in the Naval Flight Officer Candidate Program accounted for the largest proportion of both selectees and nonselectees.

Table 4

Frequency Distribution of Department Head Positions

Positions	Pilot selectees	Pilot nonselectees	NFO selectees	NFO nonselectees
Administrative	.07	.17	.23	.21
Operations	.41	.19	.40	.17
Maintenance	.35	.25	.11	.15
Safety	.09	.17	0	.08
No Major department	.08	.22	.26	.39

Table 5

Frequency Distribution of Commissioning Sources

Source	Pilot selectees	Pilot nonselectees	NFO selectees	NFO nonselectees
Naval Academy	.34	.21	.05	.07
Naval Aviation Cadet	.17	.19	.03	.03
Aviation Officer Candidate	.16	.24	.11	.18
NROTC	.15	.15	.07	.11
Officer Candidate School	.03	.05	.26	.20
Naval Flight Officer Candidate	.05	.03	.37	.25
Others	.10	.13	.11	.16

2. Billet Comparisons

Comparisons of specific billet types were conducted for the purpose of identifying the relative importance of such billets in the careers of command selectees and nonselectees. Table 6 depicts percentages representing the proportion of each group having completed at least one tour in the specific billet in question. Findings of this phase of analysis are also compared with information included in the most recent Aviation Command Screen Board (ACSB) results. Since this source of information is based on aviation-wide command screen results, not specifically VP, some caution is required in interpretation.

Analysis reveals that pilot selectees were more likely to have attained an advanced degree (P1) than pilot nonselectees. However, NFO selectees and nonselectees maintained close to equal likelihood of having received postgraduate education. ACSB findings indicate that advanced degrees are not necessarily required but certainly are not detractors in the command screen process [Ref: 3].

The percentage in parentheses under the U1 billet category in Table 6 represents the proportion of individuals having attained postgraduate degrees who were subsequently assigned to a utilization or "pay back" billet. The ACSB reports that use of postgraduate education in billets requiring such educational levels did not appear to be a significant factor in the selection

Table 6

Proportion of Sample Completing Specific Billet Assignments

	P1	U1	P2	F1	F2	F3	D1	I1	I2	I3	B1	B2	B3	S1	S2	S3	R1	T0
PILOTS																		
Selectees	.47	.21(.44)	.57	1.00	.23	.01	.99	.35	.33	.18	.07	.48	.09	.23	.34	.36	.03	1.00
Non-selectees	.36	.21(.57)	.23	1.00	.31	.02	.95	.25	.44	.11	.07	.64	.15	.19	.35	.51	.05	1.00
NFOs																		
Selectees	.24	.06(.27)	.60	1.00	.39	.06	1.00	.47	.23	.16	.16	.27	.26	.21	.32	.61	.02	1.00
Non-selectees	.26	.17(.65)	.22	1.00	.28	.02	.95	.31	.12	.14	.16	.34	.38	.18	.38	.67	.05	1.00

Note. This table illustrates the proportion of each of the four officer groups having completed specific billet assignments. The percentages in parentheses under the U1 category represent the proportion of those with postgraduate education having completed a tour utilizing such education.

process [Ref:3]. However, in this research pilots and NFOs who had postgraduate education and eventually failed to select for command were more likely to have completed utilization tours prior to the command screening point. Such information may support the perception that postgraduate utilization may prove detrimental to selection if it precludes participation in more "visible" operational assignments.

A substantially larger portion of selectees than nonselectees was found to have completed a service college tour (P2) of some type, particularly during tour positions 2 and 3. This finding probably reflects the selectivity in assignment for such tours and a tendency to afford such training to officers exhibiting greater career potential. Analysis of shore staff billets revealed that only a slightly larger proportion of selectees had completed shore staff tours (S1) in the Washington, D.C., area. For pilots, a greater portion of nonselectees had received shore staff tours (S3) directly related to warfare specialty operations. The same was true for NFOs, but to a much smaller degree.

Data indicate that a considerably larger proportion of selectees had completed tours at fleet replacement squadrons (I1). This confirms the findings of the ACSB which disclose that "fleet replacement squadron tours were very much in evidence" in board deliberations [Ref: 3]. Although not the case for NFOs, a larger proportion of pilot nonselectees had performed duties

as instructors in the flight training command (I2). This finding may substantiate a reason for the stigma which had been attached to training command positions in the past. Operational flying tours and fleet replacement squadron tours had been, and still are, considered more "visible" and career enhancing. However, for NFOs, more selectees than nonselectees had completed training command tours. In general, 1980 ACSB findings indicate more selectees with training command experience than had been the case in the recent past. Therefore, the current trend may be to shift more emphasis on training command positions, particularly during an era of pilot shortages and attrition when it is imperative to fill instructor positions. The importance of such billets is emphasized by the fact that command screen boards will be instructed "to direct particular attention to past performance as training command instructors" [Ref: 3].

A most interesting and unexpected finding was that a larger proportion of nonselectees was discovered to have completed sea duty assignments, particularly ship's company billets (B2) during tour positions 3 and 4. Even though not quite as obvious, this trend also prevailed for other sea duty billets (B3). A much more equitable distribution of sea duty assignments among all four groups was anticipated. This finding suggests that considerable, disassociated sea duty assignments may not significantly enhance a VP officer's opportunity for command selection. However, the ACSB recommends that detailers should

emphasize that shipboard tours are in fact an enhancing factor in the command screen process, but further stipulate that it proves as such only if performance is good [Ref: 3]. Performance information, as mentioned before, was not a part of this analysis due to obvious privacy considerations.

As far as operational flying tours are concerned, a greater proportion of pilot nonselectees and NFO selectees had completed a second flying tour (F2) sometime between the first operational tour (F1) and the department head tour (D1). Current aviation officer assignment policy generally precludes more than two VP operational flying tours due to other sea billet requirements which take priority [Ref: 1]. Consequently, the second flying tour (F2) is more of an exception rather than the rule, since normal assignment consists of two operational flying tours: the first operational tour (F1) and the department head tour (D1).

To summarize, the most interesting findings derived through billet comparisons are as follows:

1. Although advanced degrees had been attained by a greater number of selectees, postgraduate utilization was more prevalent among nonselectees.

2. A larger proportion of pilot and NFO nonselectees had completed ship's company sea duty tours.

3. Selectees were by far more likely to have completed service college tours.

4. Selectees were more likely to have had instructor tours in fleet replacement squadrons.

5. A larger percentage of pilot nonselectees had completed training command tours.

6. Shore tours involving warfare specialty related staff duty were completed by a larger proportion of nonselectees.

7. Pilot selectees were more likely to have been operations or maintenance officers in the department head tour. NFO selectees were more likely to have been operations officers or not to have had a major department at all during the department head tour.

8. Timing of the department head tour may prove important to command screening opportunity.

3. Conditional Probability Analysis

Since the probability of having completed a specific billet given the condition of selection or nonselection had been computed, the next phase of analysis focused on an investigation of conditional probabilities for selection or nonselection given the condition that a particular billet had been completed. The computation of conditional probabilities was readily conducted through application of Bayes' Theorem [Ref: 6:55]. Appendix D includes a sample computation of the conditional probabilities for the ship's company sea duty billet (B2) with an additional table relating joint probability considerations which are relevant for a more intuitive understanding of the results.

As a basis for this analysis, the overall command selection opportunity for VP pilots and NFOs had to be determined. This was found to be .41 and .32, respectively, as previously reported in Table 1. Based solely on the data used in this research, these percentages represent the average command selection opportunity for year groups '57 through '65. The aggregate command selection opportunity was found to be .38. The accuracy of these percentages was confirmed by personnel at the Naval Military Personnel Command (NMPC-431). It is important to note that a major reason for the NFO command selection percentage to be considerably less than that for pilots is the fact that NFOs were not considered for VP command positions until the early 1970s. A trend reflected in the data, NFO command selection opportunity is expected to increase, particularly due to the fact they are now on a much more competitive basis with pilots than before.

Overall command selection opportunity percentages were combined with previously computed conditional probabilities for having completed a specific billet given the condition of selection or nonselection. These probabilities were primary inputs in the equation for application of Bayes' Theorem. Table 7 summarizes the results for 14 of the original 18 billet categories. The T0 and F1 billet categories were not considered since everyone in the sample had completed these billets. In addition, the F3 and R1 billets were excluded because only a

very small portion of the sample had previously held such tours. The probability values included in Table 7 are defined as follows:

$P(S|X)$ - the probability of selection, given that billet "X" had been completed at some point in the officer's career.

$P(S|X^c)$- the probability of selection, given that billet "X" had not been completed at any point in the officer's career.

As shown in Table 7, the probability of selection given that a B2 tour had been completed is .34, whereas the probability of selection given that such a tour had not been completed is .50. Likewise, the complements of these conditions can easily be computed. Such findings for the B2 tour, specifically, seem contrary to generally held perceptions of the value of such tours toward command screening and promotion opportunity.

The conditional probabilities may be interpreted in two ways. First of all, the probability of selection given that the B2 tour had been completed (.34) can be compared to the probability of selection given that the same tour had not been completed (.50). This clearly shows that not having such a tour may increase the opportunity for command selection. Secondly, the probability of selection given that the B2 tour had been completed (.34) may also be compared to the overall probability of selection (.41). This may be interpreted to mean that having the B2 tour may actually result in a selection opportunity less than

the overall probability of selection. However, joint probabilities, as applied in the example illustrated in Appendix D, assist in bringing the analysis into proper perspective by depicting selection and nonselection probabilities based on the proportion of the group who had or had not completed the tour. In the example, this indicates that 58 percent of the pilot sample had completed the B2 tour and that out of that group about two-thirds were not selected for command. Not having completed a B2 tour seemed of little consequence for the remaining 42 percent, since exactly half of them was selected. Similar analysis can be conducted for each of the 14 billet categories to determine the importance of a single billet in the command screen process and, furthermore, its significance in the professional development of officers. Of more eminent value is a consideration of combinations of certain billets to approximate career paths and subsequent determination of how such paths may influence command screen opportunities and contribute to officer professional development. Such methods will be explored in Section IV.

The following is a summary of the more noteworthy conditional probability results, as depicted in Table 7:

PILOTS

1. Service college education (P2) significantly enhances command selection opportunity.

2. Postgraduate education (P1) may have some positive effect upon selection opportunity.

Table 7

Summary of Bayes' Theorem Application for Specific Billet Categories

	BILLET CATEGORIES													
	P1	U1	P2	D1	F2	I1	I2	I3	B1	B2	B3	S1	S2	S3
PILOTS[a]														
$P(S\|X)$	.48	.41	.63	.42	.34	.49	.34	.53	.41	.34	.29	.46	.40	.33
$P(S\|X^c)$	.37	.41	.28	.12	.44	.38	.45	.39	.41	.50	.43	.40	.41	.48
NFOs[b]														
$P(S\|X)$	.30	.14	.56	.33	.40	.42	.47	.35	.32	.27	.24	.35	.28	.30
$P(S\|X^c)$	.33	.35	.19	0	.29	.27	.29	.32	.32	.34	.36	.31	.34	.36

Note. This table includes results of Bayes' Theorem application for 14 of the original 18 billet categories defined. The T0 and F1 billets are not displayed because everyone in the sample had completed these billets. Billets F3 and R1 are excluded because of the very small proportion of the sample having completed such tours.

[a] Analysis for pilots is based on previously computed probabilities of selection:

$P(S) = .41;\ \ P(S^c) = .59.$

[b] Analysis of NFOs is based on previously computed probabilities of selection:

$P(S) = .32;\ \ P(S^c) = .68.$

3. Fleet replacement squadron tours (I1) seem to improve selection opportunity.

4. Training command tours (I2) may tend to restrict command selection chances, although this trend may be reversed in the near future.

5. Instructor duty at the Naval Academy, ROTC units, etc. (I3) may prove beneficial to command screening.

6. Ship's company sea duty tours (B2) and other sea duty tours (B3) may prove detrimental to command selection opportunity.

7. Staff shore duty involving warfare specialty (S3) may not be particularly enhancing.

NFOs

1. Service college education (P2) significantly improves command selection opportunity.

2. Postgraduate education does not seem to be considerably important; however, utilization of such education (U1), particularly if it precludes operational tours, seems to be detrimental to command selection opportunity.

3. Fleet replacement squadron tours (I1) are very enhancing.

4. Training command tours (I2) have considerable positive influence on command selection opportunity.

5. A second operational flying tour (F2) between the F1 and D1 tour may prove beneficial.

6. Ship's company sea duty tours (B2) and other sea duty tours (B3) may have a negative effect upon command screen opportunity.

7. Staff shore duty not involving assignment in Washington, D.C., or to a warfare specialty staff (S2) may have a negative influence.

It is important to note that performance data was inaccessible and, therefore, not included in the analysis. However, the intent of this phase of the analysis was to concentrate only on specific billets to determine their relative contribution to command screening.

IV. CAREER PATH ANALYSIS

A. PURPOSE

A more complete analysis of VP officer professional development can be achieved through investigation of combinations and sequences of billet categories that constitute career patterns. Determination of specific combinations of tours or assignments which have historically provided the experience and knowledge required for assuming command positions is a valuable endeavor for two reasons. First, it provides manpower planners with the opportunity to thoroughly scrutinize past and present management policies regarding the desired mix of assignments, as balanced against mandated requirements, so that they may develop and implement effective policies affecting future production of technically competent, qualified, professional officers. Secondly, if properly disseminated by community managers, such information may provide beneficial guidance to individual officers so that they may have a better understanding of the pertinent career structure and a more complete knowledge of which assignments may prove most rewarding and challenging, particularly if the career ambition is to attain squadron command.

Using identical data, career path analysis is a continuation of the historical billet analysis described in Section III. However, of particular concern in this phase of the research was the establishment of an additional data file consisting of complete

career paths, as defined by specific combinations of billet categories, for each case in the sample.

B. METHODOLOGY

The data file illustrated in APPENDIX C and the information provided through frequency distribution analysis of billet categories, as depicted in Table 2, were used as the basis for this phase of research. As a feasible approach to career path definition, it was determined that analysis would commence with the selection or nonselection tour (TOUR1) and work back over the previous seven tours to the tour immediately following service entry. A career path flow diagram was constructed for each of the four officer groups analyzed to establish a basis from which to compare the various career patterns.

Inspection of the frequency distributions revealed that a sample size (numbers) limitation problem might be encountered when attempting to define typical career paths using the 18 billet categories initially established. If the career patterns of all individuals in a certain billet category in the TOUR1 position were to be traced back over previous tours with 18 possible categories available, the dispersion would be such that by the TOUR3 or TOUR4 position only a very small number would continue to prevail in a common career path. A similar problem had been encountered in other research involving billet history analysis of surface warfare officers [Refs: 17 and 21]. Therefore, it was determined that more cases could be included in

specific career paths if the defined billet categories were aggregated, while still retaining categories which differ significantly. Consequently, subcategories under the shore staff, operational flying, education, instructor, and sea duty assignments were combined to form the following nine billet categories subsequently used in defining VP career paths:

S - shore staff duty
F - operational flying tour
P - postgraduate education or service college tour
I - instructor duty
B - disassociated sea duty tour
U - postgraduate utilization tour
D - department head tour
R - recruiting duty
T0- initial flight training tour

A data card for each of the 462 cases was created with the individual's career path outlined, in terms of the above billet categories, from service entry to the command screen point.

Two methods, each of which produced similar results, were employed for the purpose of defining the most prevalent career paths among each of the four officer groups analyzed. Cross-tabulation techniques, as outlined in the Statistical Package for the Social Sciences [Ref: 9: 218-248], were used to determine career paths by specifying billet categories for each tour position. For example, billet categories in $TOUR_1$ were

crosstabulated with those in TOUR2 to provide a listing of common career paths for these two tours. By stipulating certain billet categories for each preceding tour position, career paths could be computed for each of the four officer groups. A second, facile method proved to afford the same information using the IBM card sorter. Data card decks for each group were sorted by billet category starting with TOUR1. The initial sort provided separate groupings by specific billet category for the TOUR1 position. Each of these groupings was further divided for the TOUR2 position and so on until the initial flight training tour was reached or the number of cases dwindled to so few that further sorting would have proved meaningless. In fact, the categorization procedure was terminated once the group being "tracked" over a specific career path reduced to less than five in number. Frequently, this occurred by the time the TOUR4 position was reached, although some career paths continued to be tracked back to TOUR6 or TOUR7.

By referring to the career path flow diagram for pilot selectees in Figure 2, the sorting process can be traced as follows. A total of 73 pilot selectees was found to have been in shore staff billets at the time of selection (TOUR1). To determine which billets were most common for this group immediately prior to TOUR1, the sorting process was completed for the TOUR2 position. The result was that 45 of the 73 had been in department

head billets, 14 of the 73 had been enrolled in postgraduate school or service colleges, with the remainder of the group dispersed among five other billet categories. Further, career paths of the 45 officers who were department heads in TOUR2 were additionally examined to discover which billets had been completed in TOUR3. In this case a majority was discovered to have been in either disassociated sea duty tours (B) or in postgraduate school or service college (P).

Once common career paths were identified, probabilities were computed for having completed a specific path given selection or nonselection. When combined with overall selection opportunity probabilities, this information could be used via Bayes' Theorem to determine selection probabilities given that certain career paths had been followed. In addition, comparisons could be made between career paths among pilots only, among NFOs only, and among pilots and NFOs combined.

C. FINDINGS

Figures 2 through 7 include the results of career path analysis in the form of career path flow diagrams for each of the four groups and for separate, aggregate samples of selectees and nonselectees. The diagrams clearly illustrate considerable dispersion in career paths within each group. Even with billet categories aggregated to a total of only 9, sample size limitations severely restricted the number of individuals who could

be "tracked" over a specific career path. However, the most prevalent career paths could be defined by concentrating on those which contained the greatest numbers of individuals for each group analyzed.

Although several complete career paths were identified, most were terminated at the TOUR4 position because of excessive dispersion. Consequently, the career sequences illustrated in Figures 2 through 7 represent, in a majority of cases, only the most recent three or four tours in career paths which in fact consisted of up to seven tours. It is important to note in particular, that for the 462 cases examined, the average career path to the command screen point included six tours. Therefore, career sequences defined in this phase of the research reflect only the later portions of VP career paths. However, this is the more variable portion of the VP career path, since the initial two tours normally consist of the standard flight training phase and the operational squadron assignment.

1. Career Path Identification

Examination of pilot selectee and nonselectee flow diagrams revealed that the most frequent paths appeared to be the SDPB and SPDB sequences. This also proved to be the case for NFO selectees. In contrast, two different sequences, SDBS and DSSB, were found as most prevalent for NFO nonselectees.

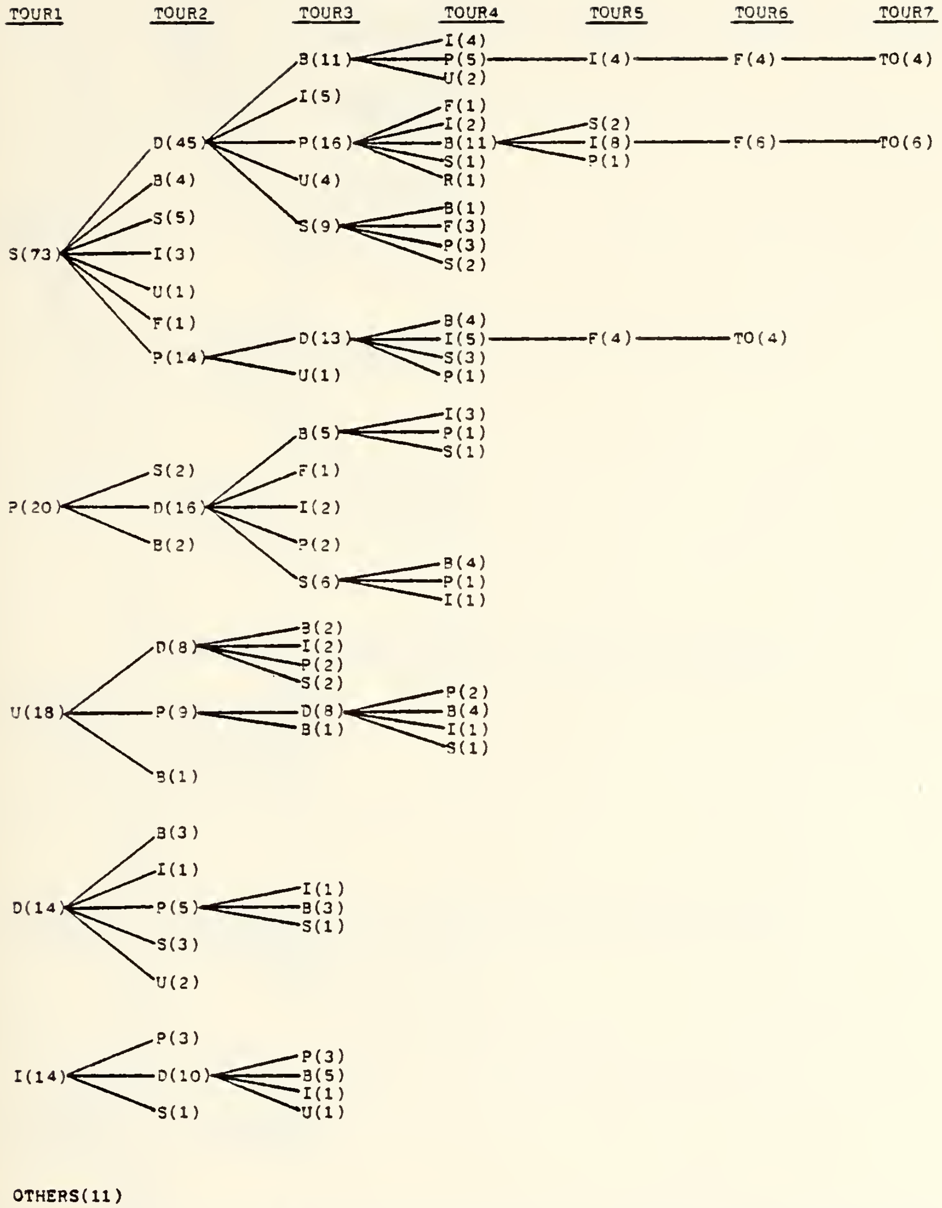

Figure 2. Career Path Flow Diagram for 150 Pilot Selectees. TOUR1 is the assignment at time of selection. Numbers in parentheses are numbers of pilots with the sequence indicated at the tour position. Specific billet categories are defined on page 44.

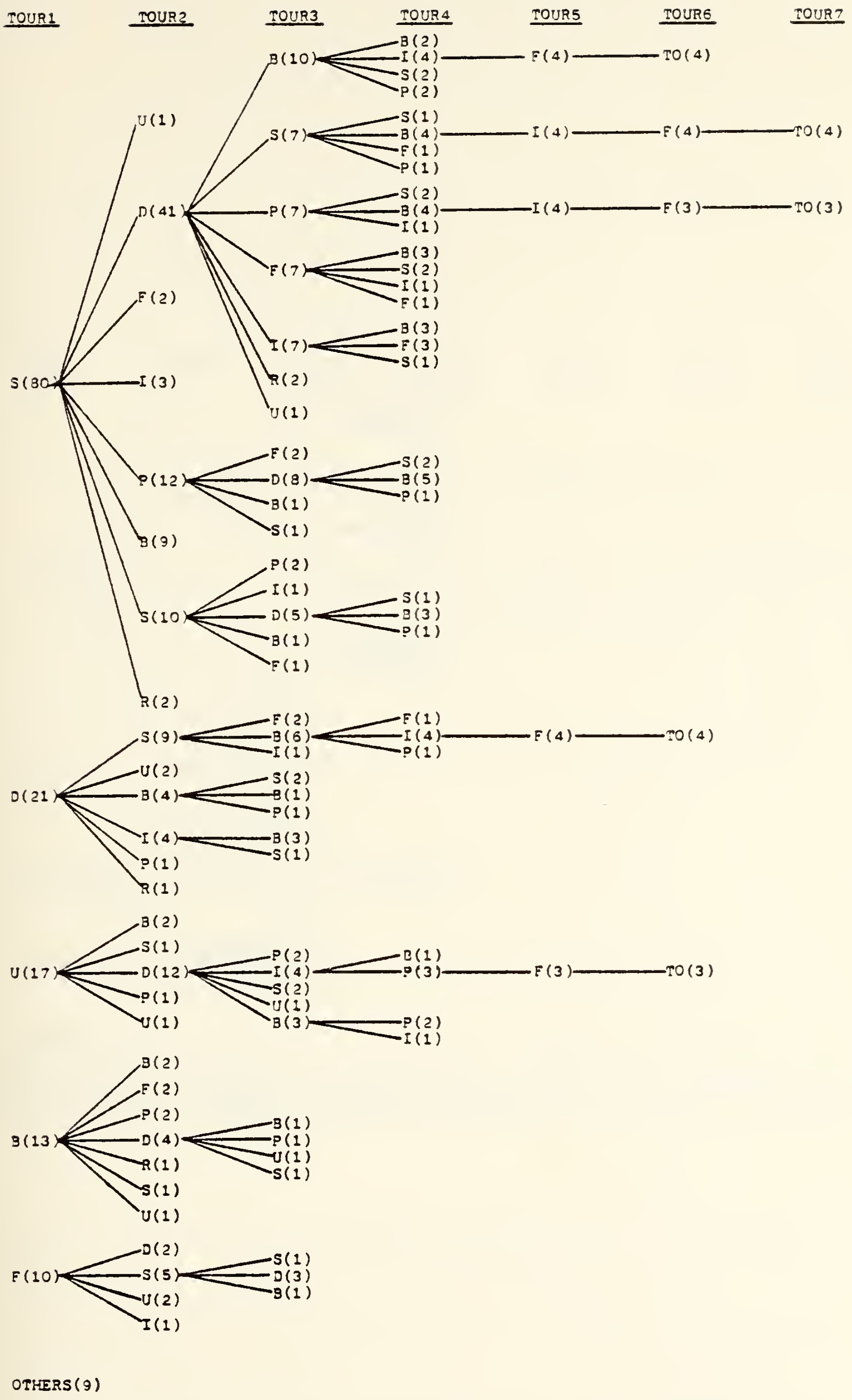

Figure 3. Career Path Flow Diagram for 150 Pilot Nonselectees. TOUR1 is the assignment at time of nonselection. Numbers in parentheses are numbers of pilots with the sequence indicated at the tour position. Specific billet categories are defined on page 49.

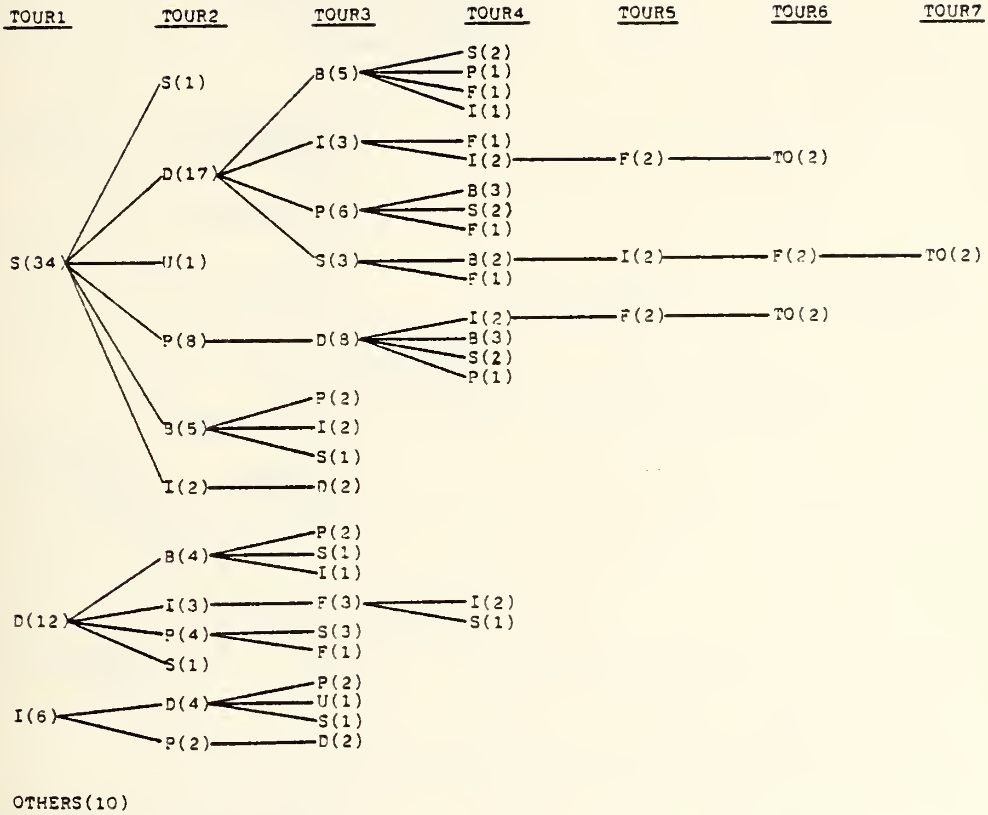

Figure 4. Career Path Flow Diagram for 62 NFO Selectees. TOUR1 is the assignment at time of selection. Numbers in parentheses are numbers of NFOs with the sequence indicated at the tour position. Specific billet categories are defined on page 49.

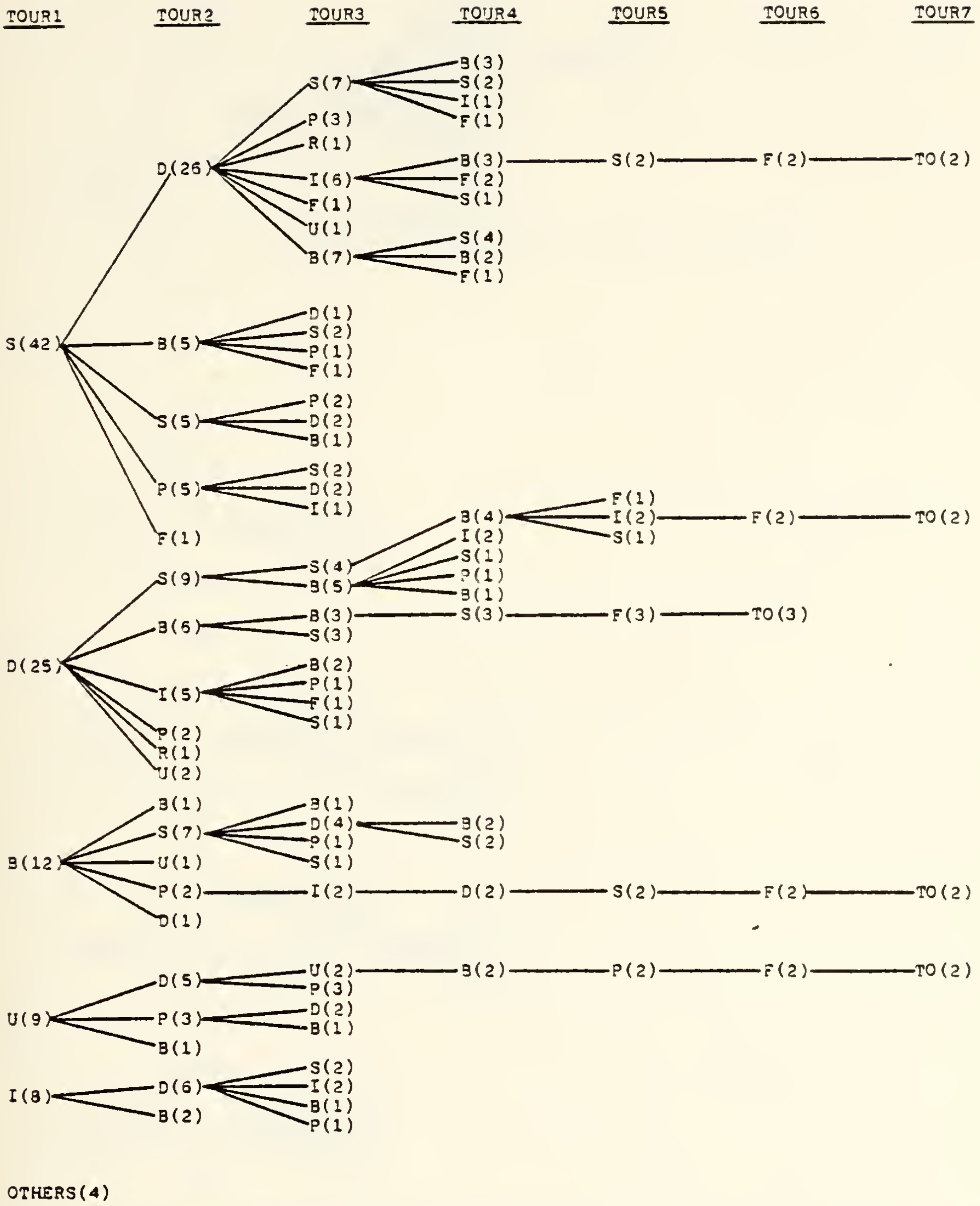

Figure 5. Career Path Flow Diagram for 100 NFO Nonselectees. TOUR1 is the assignment at time of nonselection. Numbers in parentheses are numbers of NFOs with the sequence indicated at the tour position. Specific billet categories are defined on page 49.

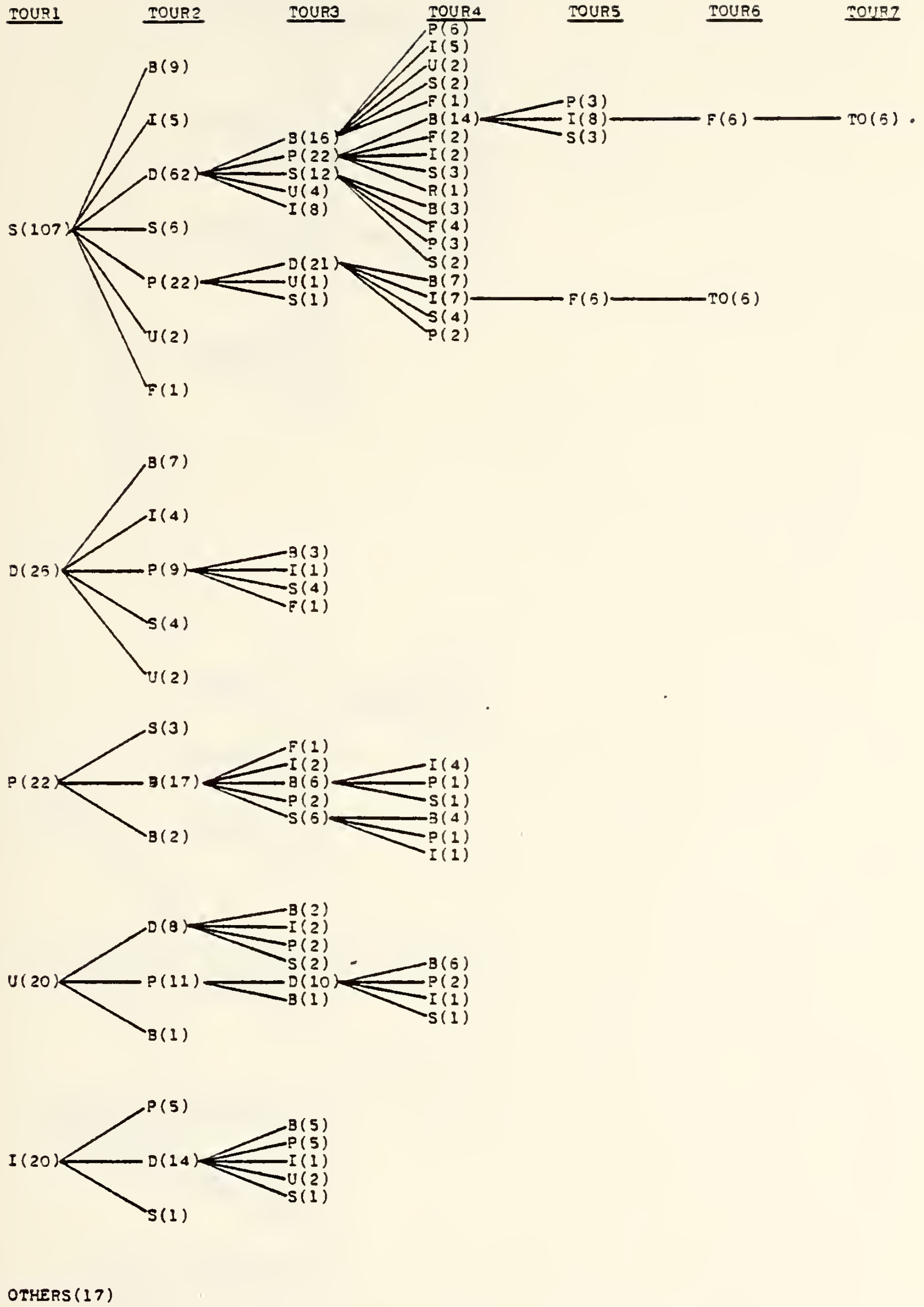

Figure 6. Career Path Flow Diagram for 212 Pilot and NFO (Aggregate) Selectees. TOUR1 is the assignment at time of selection. Numbers in parentheses are numbersof pilots and NFOs with the sequence indicated at the tour position. Specific billet categories are defined on page 49.

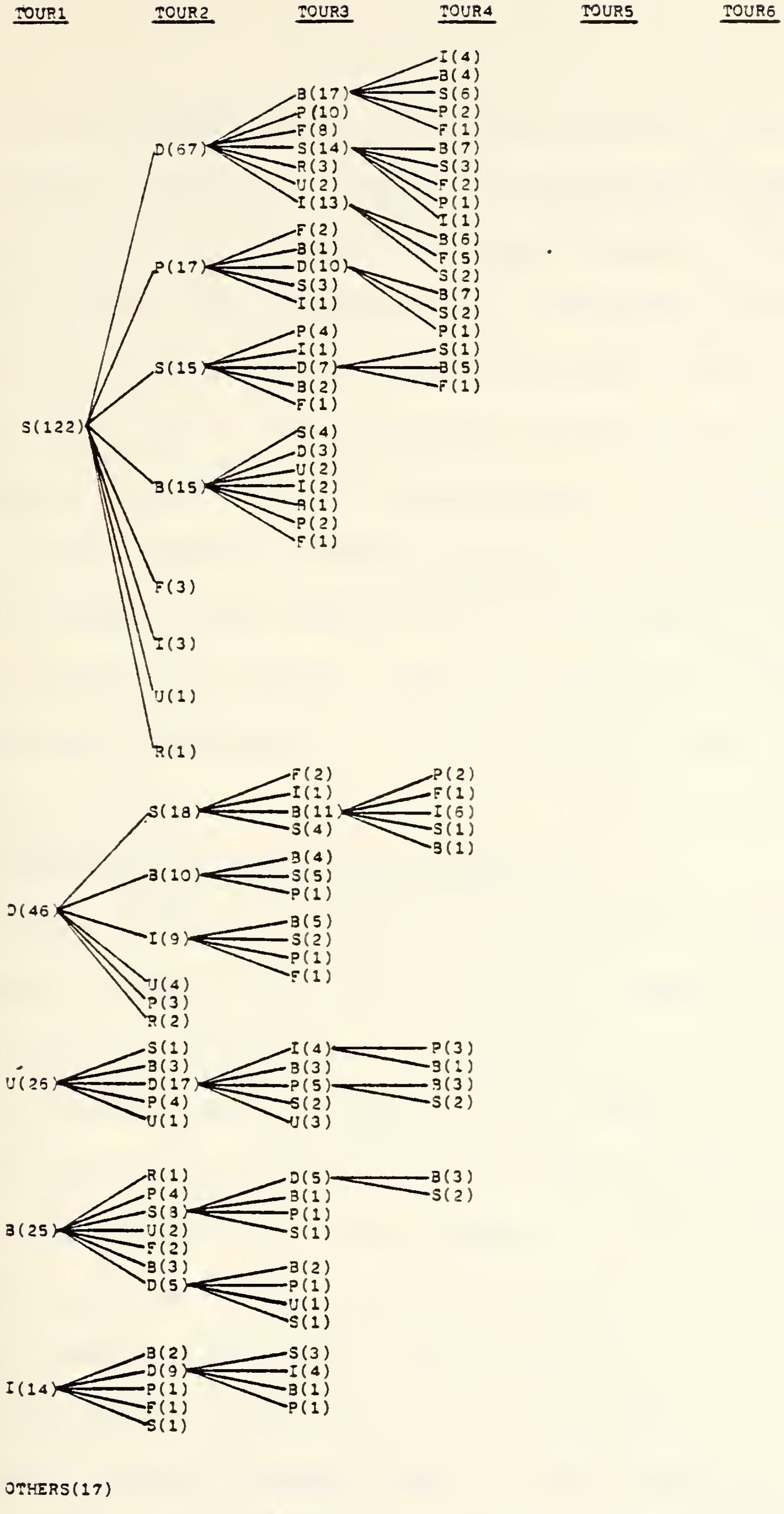

Figure 7. Career Path Flow Diagram for 250 Pilot and NFO (Aggregate) Nonselectees. TOUR1 is the assignment at time of nonselection. Numbers in parentheses are numbers of pilots and NFOs with the sequence indicated at the tour position. Specific billet categories are defined on page 49.

In an attempt to define specific career paths with more individuals per sequence, pilots and NFOs were combined to form aggregate groups of selectees and nonselectees. This proved beneficial in that such combination considerably enhanced identification of certain career paths which may have otherwise gone unnoticed. Figures 6 and 7 include career path flow diagrams for aggregate selectees and nonselectees. For selectees, even though the SDPB sequence clearly appeared as the most common, reasonable numbers were additionally maintained in the SPDB, UPDB, SDBP, and SPDI career paths. Relatively large concentrations of nonselectees prevailed in the SPDB, SDSB, SDBS, SDIB, and DSBI career paths.

2. Conditional Probability Analysis

Bayes' Theorem was applied to determine conditional probabilities of command selection, given the completion of a specific career path or portion thereof. Results of this analysis are included in Tables 8 and 9. The relative importance of the sequences listed can be ascertained by comparison of the percentages of both columns for each sequence. The first column in each table represents the probability of selection given that a particular sequence had been completed during the officer's career. The second solumn shows the probability of selection given that a certain sequence had not been completed at any time during the officer's career. As an example, Table 8 shows

Table 8

The Probability of Selection Given Specific Career Path Sequences for Pilots and NFOs

PILOTS

Career Path Sequence	$P(S\|X)$[a]	$P(S\|X^c)$[b]
SDBP	.68	.41
SDPB	.62	.40
SPDB	.41	.41
SDBI	.41	.41
UDIP	.26	.41
PDS	.74	.40
SDS	.45	.41
SDBP SDPB SPDB	.56	.39
SDBP SDPB	.66	.39
SDPB SPDB	.54	.40

NFOs

Career Path Sequence	$P(S\|X)$	$P(S\|X^c)$
SPD	.75	.29
SDP	.61	.30
SDB	.35	.32
SDS	.25	.32
SDI	.28	.32
SDP SPD	.68	.28

Note. This table displays Bayes' Theorem results for separate samples of pilots and NFOs. Unique career sequences and combinations of similar sequences are included.

[a] $P(S|X)$ - The probability of selection given that sequence "X" had been completed during the officer's career.

[b] $P(S|X^c)$ - The probability of selection given that sequence "X" had not been completed at any time during the officer's career.

Table 9

The Probability of Selection Given Specific Career Path Sequences for an Aggregate Sample (Combination of Pilots and NFOs)

	AGGREGATE	
Career Path Sequence	P(S|X)[a]	P(S|X^c)[b]
SDPB	.68	.37
SDBP	.65	.38
SDBI	.48	.38
SPBD	.38	.38
SDIB	.33	.38
SDBS	.23	.38
SDSB	.17	.38
UPD	.75	.37
SDP	.61	.36
SPD	.61	.38
DPS	.55	.38
SDB	.41	.38
SDS	.38	.38
UDP	.23	.38
SBS	.23	.38
IDI	.23	.38
SDPB SDBP	.65	.37
SDSB SDBS	.20	.39
SDBP SDPB SPDB	.57	.36

Note. This table displays Bayes' Theorem results for an aggregate sample of all pilots and NFOs. Separate career sequences and combinations of similar sequences are included.

[a] P(S|X) - The probability of selection given that sequence "X" had been completed during the officer's career.

[b] P(S|X^c)- The probability of selection given that sequence "X" had not been completed at any time during the officer's career.

that if the SDBP sequence had been completed, selection probability was increased from 41 to 68 percent. In contrast, if the UDIP sequence had been completed, selection probability was decreased from 41 to 26 percent.

Five separate career paths consisting of four tours each and representing the most common sequences were examined for the pilot group. In addition, two career sequences with three tours each were included in the analysis. For pilots, the SDBP path was most prevalent, exhibiting a selection probability of 68 percent. However, although undertaken by a very small number of individuals, the sequence providing the greatest selection probability was the partial path from shore staff duty to department head and then to service college or postgraduate school (PDS).

Table 8 also depicts the findings for five separate NFO career paths. Contributing substantially to command selection probability, the SDP and SPD career sequences were the most frequent for this group. The SDB sequence seemed to be a marginal contributor, whereas the SDS and SDI paths reduced selection probability considerably.

Another interesting aspect of the analysis is a comparison of specific career paths to determine how differences in billet sequences might affect selection probability. For example, comparison of the SPDB, SDPB, and SDBP sequences for pilots shows that an officer's chances of selection improve from 41 to 62 to 68 percent the earlier the P tour is completed during the career sequence.

For NFOs, the position of the D tour may be important in the SDP and SPD sequences. Contrary to pilot findings, occurrence of the D tour somewhat earlier seems to increase the selection probability for NFOs. Comparison of the SDP, SDB, SDS, and SDI sequences indicates that it may be more enhancing to have a P tour preceding the D tour, rather than a B, S, or I tour. This finding further substantiates the relative importance of postgraduate education and service college assignments.

Table 8 also shows conditional probabilities of selection given several combined career sequences. As an example, all pilots having the SDBP or SDPB sequence were consolidated into one group, since the only major disparity in these career paths was the order of occurrence of the P and B tours. A combination of these sequences results in a conditional selection probability of 66 percent as compared to 39 percent if this combination had not been completed.

Conditional probability results for the aggregate sample are included in Table 9. Comparison of the UPD and UDP sequences reveals that having the postgraduate education or service college tour (P) after, instead of prior to the department head tour (D), is clearly more enhancing. However, it is important to note that the results are based on a relatively small number of individuals having followed such sequences.

By far the most common for the aggregate case, the SDBP and SDPB paths are very enhancing, separately and in combination,

whereas the SDBS and SDSB sequences prove to be quite detrimental to command selection. Once again, the relative position of a specific billet within the sequence, namely the D tour's position relative to the P tour, affects selection probability.

Further review of aggregate findings reveals that even though the particular billet sequence may have a positive or negative effect, the existence or absence of a unique billet in that given sequence may significantly influence selection probability. For instance, in the SDSB (.17) and SDPB (.68) sequences, the latter maintains a selection probability four times greater than that for the former. Therefore, this finding implies that the major contributor to the increased selection probability is precisely the postgraduate education or service college tour (P). Again, it is important to note that performance information is not included in this analysis. The enhancing nature of the postgraduate education and service college tours may be partially attributable to the fact that high performance is normally a prerequisite for assignment to them.

In summary, comparison of career paths with concentration on billet sequences and compositions of sequences has enabled identification of those assignments or sequences of assignments which are important and contribute the most toward VP officer professional development. Although sample size proves to be a limiting factor in this analysis, the method employed

has adequately distinguished the most prevalent career paths pursued by VP officers. Conclusions are mitigated to some extent by the fact that many sequences were followed by relatively small numbers of individuals. This was a result of the substantial dispersion in career paths which seems inherent in the VP aviation community. Similar analyses for other aviation communities would most likely be confronted with the same problem. In general, results seem to indicate that even though certain sequences may greatly enhance command selection probability, there is no single career path which ideally leads to command.

V. DISCUSSION OF THE VP CAREER STRUCTURE

The purpose of historical billet and career path analysis was to examine officer professional development and define a career structure for VP aviators. Emphasis was placed upon specific billets and career paths from service entry to the squadron command position. The full impact of the findings is somewhat attenuated by the fact that performance information was inaccessible and, therefore, not incorporated in this research. Individual performance is, unquestionably, a major factor in selection for certain billet assignments and the screening process for command. Nevertheless, the intent of the foregoing analysis was to focus only on specific billets and combinations thereof to determine the relative contribution of each to command selection probability.

Application of frequency distribution methods and Bayes' Theorem disclosed valuable information regarding billet types assigned, frequency of assignment, and as to which billets appeared to be career enhancing. Comparisons among selectees and nonselectees revealed that there are certain billets which are common among these groups and which affect command selection probability to differing degrees. The department head (D1), service college (P2), postgraduate education (P1), and disassociated sea duty tour (B1, B2, B3) were by far the most influential to selection.

Career path analysis considered billet combinations and sequences for identification of the most prevalent paths which have historically been completed by VP officers. An interesting finding was the fact that the existence of one specific billet in a particular sequence of three or four tours could substantially improve or impair selection probability. Arrangement of certain billets within a given career path was also discovered to drastically affect selection opportunity in some cases. Considerable dispersion experienced among career paths implies that there are numerous routes to command selection or nonselection. Although several sequences were more common than others, the general conclusion of this career path analysis is that there appears to be no unique sequence of billets which will always lead to squadron command.

Perhaps the most valuable feature of these historical billet and career path analyses, was the success in delineating a common career structure which depicts crucial flowpoints and typical options present during careers from service entry to command. Based upon findings of the preceding analysis and defined using the original 18 billet category codes, Figure 8 represents a career structure characteristic to the VP community. A logical sea/shore rotation schedule is illustrated with various career alternatives available at each level. Since previous findings indicate that the department head billet seems extremely important to VP aviators, it is displayed as a single, critical node

through which, in reality, nearly all VP officers traverse on the way to command screening. Similarly, flight training and the first operational squadron tour are listed separately since these are normally the first two tours encountered after service entry. The VP career structure exhibited allows 960 possible paths from flight training to squadron command. Since it incorporates nearly all, and certainly the most prevalent career alternatives available, this representation is considered to be an accurate depiction of VP officer professional development.

Career structures similar to that outlined in Figure 8 can prove valuable as foundations from which to develop manpower models designed to assist community managers in resource utilization and planning. Historical billet and career path analyses are beneficial in delineating specific model parameters such as billet types, tour positions, and tour dependencies. Preliminary investigation of such parameters for any warfare community being examined is important for identification of the relevant aspects of career development. Using the career structure presented in Figure 8 as guidance, the following sections focus on the development and application of an interactive manpower model for the VP community.

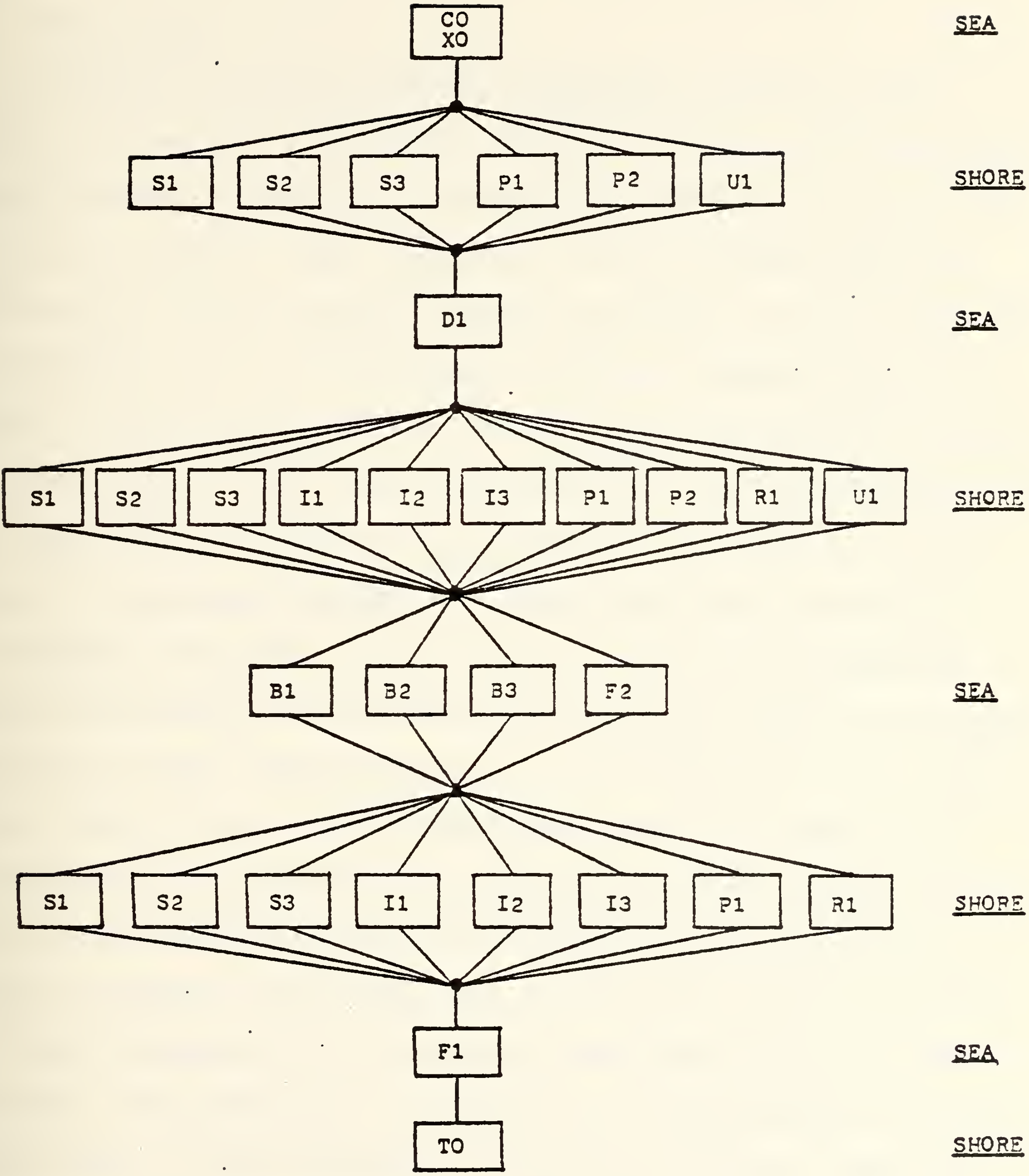

Figure 8. VP Career Structure

VI. THE VP SEATOURS MODEL

A. INTRODUCTION

As manpower problems become increasingly complex in the 1980s, the need for more exact, reliable planning and forecasting methods becomes imperative. Frequently, manpower management is reactive in nature, where immediate action is prescribed and undertaken to solve eminent, critical problems. This often leads to implementation of shortsighted, patchwork methods which are likely to prove inadequate in the long run. An accurate manpower model can help to avoid such situations by providing managers with the capability to establish more effective and efficient utilization of available manpower in present and future scenarios.

Manpower management within the U.S. Navy can be improved through development and employment of planning models which assist analysts in early identification of, and selection of the appropriate response to, potential manpower problems. Application of such models can provide an automated processing capability which significantly enhances the manager's ability to detect trends in manpower employment and to accurately analyze present and future alternatives to personnel assignment and utilization policies. The advantages are evident in a considerable savings in time and in actual resources, as well as a higher degree of reliability than current methods. Therefore, increased use of manpower planning models can provide a more timely, accurate, and effective means for decision making and planning.

Research is currently being conducted to develop interactive computer models for the major unrestricted line (URL) communities within the U.S. Navy [Refs: 7 and 8]. Development of a model for the VP (Maritime Patrol) community is based upon the mathematical formulation and program used in a recently completed model for the Submarine Officer Corps [Ref: 18]. Even though the mechanics of the program are the same, model parameters differ due to inherent disparities in the aviation and submarine communities. The VP SEATOURS model is, therefore, an adaptation which specifically employs criteria directly relevant to the VP community.

B. MODEL DESCRIPTION

The VPTOURS program employs the APL programming language [Ref: 4] which allows for easy interaction, substantial versatility with vector and matrix data, and a continuous flow of information between the computer and analyst. The objective of the program is to calculate seatour opportunities, expressed in the form of a ratio of manpower requirements to available inventory. Appendix E includes a printout of the VPTOURS computer program as derived from the SUBTOURS program of Ref. 18.

Manpower requirements for specific sea duty assignments are determined using two data inputs: number of sea duty assignments by type and number of billets per type for each tour position. As illustrated in Figure 9, the five tour positions used in this model depict the normal sea duty tours undertaken

by VP aviators during their careers. These tours correspond directly to the sea duty tours previously shown in Figure 8, except that the disassociated sea duty tour may consist of several assignment possibilities and the Major Sea Command tour is added in Figure 9. The tour positions illustrated in Figure 9 represent years of commissioned service required to become eligible for certain billets and the length of the tour while in that billet. The number of officers available to fill required billets is determined using tour positions and the inventory of officers, as projected for future years by year group and rank.

A peculiarity of the SUBTOURS model is that officers with rank at or above the normal rank for a particular tour are considered available for that tour. The VP SEATOURS model is more definitive in that it is programmed to specify the lower and upper limits of the grades of officers considered available for specific seatour positions.

Requirements for sea duty assignments are matched with projected manpower supply. The resultant output, the SEATOURS OPPORTUNITIES matrix, depicts specific tour positions with seatour opportunities expressed as a ratio of requirements to supplies projected for future years. A ratio of less than one indicates the chance of any one of the available officers obtaining a seatour billet in that tour position, whereas a ratio

RANK	Y.O.S.	VP SEATOURS
CAPT	25	▨
	24	
	23	5 MAJOR SEA COMMAND
	22	
CDR	21	▨
	20	
	19	4 COMMANDING OFFICER EXECUTIVE OFFICER
	18	
	17	▨
	16	
LCDR	15	3 DEPARTMENT HEAD
	14	
	13	
	12	▨
	11	
	10	
LT	9	2 DISASSOCIATED SEA TOUR SHIP/STAFF/SQUADRON
	8	
	7	▨
	6	
	5	1 FIRST OPERATIONAL TOUR DIVISION/BRANCH OFFICER
LTJG	4	
	3	
ENS	2	▨
	1	

Figure 9. VP Seatours Positions

greater than one implies that the tour is undermanned. In the latter case, the ratio is expressed as a percentage in parentheses, indicating the amount by which the specific tour in a certain year is undermanned.

The utility of the model lies in the ability to manipulate the data in the computation of the seatour opportunities. Immediate access to data display and the ease of changing relevant information from any point in the program enhances model versatility. Input information can be altered temporarily or permanently, thereby allowing the user considerable flexibility in testing various alternatives for specific manpower planning situations.

Through model application analysts can more effectively detect trends necessitating immediate changes to current policies, test proposed alterations, and analyze outcomes in a cost-effective manner. For example, if additional ships or squadrons are programmed to enter the fleet requiring new billets to be filled over a certain time frame, model application can determine the resultant effect upon seatour opportunities for the available officer inventory. Changes can also be made in the professional development path through alterations in tour position start points and durations. As an example, the effects of lengthening a department head tour from two to three years can easily be determined.

The VP SEATOURS model can be used to determine seatour opportunities for pilots and NFOs, separately, or for an aggregate situation including all VP aviators. Inventory and billet requirement data are stored separately for the aggregate, pilot only and NFO only situations. Each category may be individually analyzed by simply using a COPY command which transfers pertinent data to the main APL workspace prior to commencing the program run.

C. MODEL OPERATION

The main program function, VPTOURS, is initiated by indicating the number of years desired for projection and the calendar year in which the stored data begins: 6 VPTOURS 1980. If requested, a set of program instructions may then be displayed. The next step involves selection of one of three subprogram options: DISPLAY, CHANGE, and SEATOUR.

The DISPLAY function formats the data used in seatour opportunity calculation and allows for display of the following four matrices: sea duty assignments by type (Table 10), position of seatours with respect to years of service (Table 11), billet requirements for each sea duty assignment per tour (Table 12), and officer supply for the selected time interval by time in service (Table 13). Although supply information is stored in a three dimensional matrix by rank (ensign through captain), the information displayed represents only total supply over all

ranks by years of service and projected for the requested number of fiscal years.

The CHANGE function allows the analyst an opportunity to alter any data included in the display function except for the supply of officers. Changes are possible for sea duty assignment projections, tour positions, and billet requirements for each sea duty assignment. Supply data originate from an outside source using another predictive model [Ref: 15]. Therefore, such information is not alterable through the CHANGE function and may only be varied upon receipt of updated supply projections.

When selected, the SEATOUR subroutine generates the seatour opportunity ratios. Matrices of officer requirements and officers available by tour positions and fiscal years are first presented. This information is followed by the final output of seatour opportunities, expressed in ratio format, by tour position and fiscal year from the start year projected for as many years as originally requested.

D. VP MODEL PARAMETERS

The VP SEATOURS model is designed to focus on manpower utilization in the VP community with specific emphasis on sea duty assignments. Model accuracy is dependent upon the parameters chosen for entry in the four data input matrices mentioned above. Although previous historical billet and career path

analyses concentrated on the career structure up to the command position, the scope of the VP SEATOURS model is expanded to encompass the entire career progression from the rank of ensign to that of captain. However, it is limited by the fact that analysis is restricted only to sea duty assignments. Shore duty options previously examined and displayed in Figure 8 are excluded in the model. Future research may provide a more complete analysis by inclusion of shore duty assignments as well.

1. Sea Duty Assignments

Sea duty assignments for VP aviators were determined using previous career path analysis and the disassociated seatour options as outlined in Ref. 14. The matrix in Table 10 shows the 15 sea duty assignments selected for use in the VP SEATOURS model with projected numbers of such units over the next six fiscal years.

The first six assignments represent those aviation squadrons to which VP aviators may be assigned for sea duty tours. The first one (VP) constitutes the major sea duty assignments for all VP aviators since this option includes the first operational flying tour, department head tour, and executive and commanding officer positions. The other five squadrons (VPSD, VXE, VXN, VC and VR/VRF) represent possible options for the second, disassociated sea duty tour. Since it has recently been designated as a separate warfare specialty, the VQ option is not included in the VP SEATOURS model.

Table 10

PROJECTIONS OF SEA DUTY ASSIGNMENTS BY TYPE

SEA DUTY ASSIGNMENTS		1980	1981	1982	1983	1984	1985
1	VP	24	24	24	24	24	24
2	VPSD	2	2	2	2	2	2
3	VXE	1	1	1	1	1	1
4	VXN	1	1	1	1	1	1
5	VC	3	3	3	3	3	3
6	VR/VRF	3	3	3	3	3	3
7	PEP	5	5	5	5	5	5
8	CV	13	13	13	13	13	13
9	AMPHIB	7	7	7	7	7	7
10	SERVF	3	3	3	3	3	3
11	CARGRU	8	8	8	8	8	8
12	TSC	8	8	8	8	8	8
13	NAVFAC	7	7	7	7	7	7
14	CRUDGR	6	6	6	6	6	6
15	PATWING	4	4	4	4	4	4

The personnel exchange program (PEP) enables qualified officers an opportunity to undertake sea duty assignments in squadrons of five participating foreign countries. The CV designation represents aircraft carriers on which VP sea duty assignments are available. AMPHIB and SERVF categories define the average number of amphibious and service force units, respectively, on which VP aviators may serve at any given time. The average number is used since VP aviators can be assigned to a small proportion of the total amphibious and service force units in the Navy's current inventory.

The sea duty assignment matrix is completed by inclusion of sea-going staff positions and shore assignments which are counted as sea duty. There are five of these, defined as follows: Carrier Group Staffs (CARGRU), Tactical Support Centers (TSC), Naval Facilities (NAVFAC), Cruiser-Destroyer Group Staffs (CRUDGR), and Patrol Wing Staffs (PATWING).

2. Tour Positions

VP tour positions with respect to years of service were derived using the VP career structure depicted in Figure 8 and through assistance from manpower analysts in the Naval Military Personnel Command and in the Manpower Personnel/Training (MPT) Division (OP-13) of the Office of the Deputy Chief of Naval Operations (DCNO). Figure 9 illustrates VP seatours positions by type, rank, and years of commissioned service. The hashed areas represent shore duty tours normally occurring between sea duty assignments. The starting point and duration of each of the five seatours are required to establish the matrix in Table 11:

Table 11

TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER	1	2	3	4	5
TOUR START	2.0	7.0	12.0	16.5	21.0
TOUR LENGTH	3.0	2.5	2.5	2.0	2.0

Applicable to both pilots and NFOs, tour starts and lengths are accurate to within six months. It is recognized that there may be some instances where necessary tour extensions or early terminations may occur. However, on the average, the position of VP seatours, as depicted above, is considered sufficiently accurate for modeling purposes.

3. Billet Requirements

Billet requirement information for specific tour positions was determined using VP Squadron Manning Documents (SMD) which designate mandated billets by rank for VP pilots and NFOs [Ref:12]. Personnel at the Naval Military Personnel Command (NMPC 432i/432p) served as confirming sources for this and other pertinent data. Billet requirements for the other five squadron categories were similarly determined, but the process was somewhat complicated by the fact that these units are not exclusively comprised of VP aviators. With the exception of VP Special Detachments (VPSD), these squadrons do not maintain billets explicitly for VP pilots and NFOs, but ones which may be normally filled by any pilot or NFO. Several ship and staff assignments were also less definitive for the same reason. Therefore, billet requirements specified in the model for each sea duty assignment represent those specifically designated for VP aviators plus those which, on the average, are filled with VP personnel.

The billet requirement matrix in Table 12 defines VP billets by tour position for each sea duty assignment:

Table 12

BILLET REQUIREMENTS

SEA DUTY ASSIGNMENTS		TOUR POSITIONS				
		1	2	3	4	5
1	VP	50	0	7	2	0
2	VPSD	0	9	0	0	0
3	VXE	0	3	2	1	0
4	VXN	0	3	2	1	0
5	VC	0	1	1	1	0
6	VR/VRF	0	4	0	3	0
7	PEP	0	3	0	0	0
8	CV	0	10	0	0	0
9	AMPHIB	0	2	0	0	1
10	SERVP	0	1	0	0	1
11	CARGRU	0	2	0	0	0
12	TSC	0	8	0	1	0
13	NAVFAC	0	1	0	1	0
14	CRUDGR	0	1	0	0	0
15	PATWING	0	0	0	0	1

The matrix indicates, for example, that each aircraft carrier (CV) normally has 10 billets to be filled by VP aviators in the second tour position. Similarly, CARGRU staffs have two billets and CRUDGR staffs one billet which may be assigned to VP aviators in the second tour position. There are 9 billets exclusively for VP officers in Tactical Support Centers (TSC): 8 in the second and 1 in the fourth seatour position. Most PATWING staff assignments are generally

considered shore duty; however, the Patrol Wing Commander position is used as a sea duty tour in the model since it involves major command of operational squadrons. Several amphibious and service force units may also provide major sea command positions for VP aviators [Ref:16]. Although many of the billet requirements listed above are based on "average" conditions, the versatility of the model facilities alterations when exact requirements become known.

4. Supply

The supply matrix in Table 13 represents the total supply of VP officers by years of service, as projected for the selected number of fiscal years. It is derived from supply information stored by rank, years of service, and fiscal year in a three dimensional array. This inventory data projected from 1980 through 1986 were obtained from the Officer Management Simulation Model (OMSM) currently in use by analysts in the MPT Division (OP-13) of the Office of DCNO [Ref: 15]. Based on inventory data as of 30 September 1979, this information is entered as a three dimensional supply array. The matrix in Table 13 represents the total supply of VP aviators by years of service as projected for six fiscal years:

Table 13

YEARS OF SERVICE	1980	1981	1982	1983	1984	1985
1	207	207	207	207	207	207
2	234	400	400	400	400	400
3	306	230	391	391	391	391
4	337	291	222	372	372	372
5	333	267	229	177	293	293
6	282	235	193	163	116	207
7	171	206	167	140	117	74
8	127	145	174	139	118	97
9	129	120	134	156	126	112
10	109	96	84	99	117	92
11	140	97	85	75	89	105
12	129	126	87	77	71	84
13	100	123	120	84	74	68
14	95	78	96	94	70	70
15	81	71	63	79	77	54
16	71	79	70	61	77	75
17	61	68	75	66	58	73
18	63	58	65	72	63	56
19	50	57	54	60	66	59
20	44	41	45	38	34	55
21	37	28	22	26	24	27
22	45	25	24	22	26	24
23	35	41	23	22	20	24
24	35	32	38	21	20	19
25	19	30	28	32	18	17
26	21	17	28	25	30	17
27	10	17	14	23	21	24
28	7	7	13	10	17	15
29	2	5	5	10	8	13
30	4	2	5	5	10	8

E. MODEL ASSUMPTIONS AND LIMITATIONS

Model development with specification of relevant parameters must be simple enough for ease of computation, yet complete enough so as to provide the most accurate representation of the subject being modeled. When attempting to simulate reality as closely as possible, it is necessary to establish certain assumptions which govern model application. The following assumptions and limitations are those which are outlined in Ref. 18 and include those which are, additionally, pertinent to the VP SEATOURS model:

1. Model structure necessitates the assumption that all personnel follow the career structure exactly as defined. As shown by the analysis in Section IV, this is not the case in reality.

2. Only those officers with years of commissioned service matching tour position parameters and of appropriate rank are considered available to fill requirements.

3. Each tour position is assumed to commence at the same time in a specific year of service for all sea duty assignments in the model. This assumes that each tour is renewed at the same time each year since officers' year group is linked directly to fiscal year. This does not represent the "real world" situation; however, the times should average out over a span of years.

4. It is assumed that the number of billets per sea duty assignment will not change over time. If such changes are desired, the model can be run for each new set of circumstances.

5. As previously mentioned, the supply of officers is not subject to direct alteration. Officer inventory can only be changed by reassigning values to elements of the supply array outside of the program function. This certainly limits analysis of accession policy alternatives. However, updated information can be requested and entered in the three dimensional supply array.

6. VP supply data includes all "due course" officers. Those CDRs and LCDRs who have failed to select for promotion to the next higher grade are excluded from the supply array, since they are no longer considered available to fill major command and squadron command positions. The officer inventory data was entered this way since promotion to the next higher grade is normally a prerequisite for available command positions.

VII. MODEL APPLICATION AND ANALYSIS

A. INTRODUCTION

The VP SEATOURS model allows manipulation of relevant criteria affecting the utilization of VP officers and provides a means for calculating seatour opportunities over a forecasting period. The following analysis is designed to illustrate model capability through simulation of various scenarios which may represent alternatives available to community analysts for solving current aviation manpower problems. Several options examined for the VP community are similar to those proposed in a recent Unrestricted Line (URL) Officer Study for the entire aviation community [Ref: 13]. However, it is important to emphasize that alternatives presented in this research do not necessarily reflect current planning of the Manpower Personnel Training Division (OP-13) of the Office of the DCNO.

By using the VP SEATOURS model there are primarily two areas in which manpower managers may readily vary pertinent data to affect the outcome of seatours opportunity:

1. Alterations in billet structure for specific sea duty assignments and tour positions.
2. Alterations in tour positions through additions, deletions, or changes in starting points and durations.

Although the implications of resultant seatour opportunity ratios may have considerable impact upon management planning

and alternative selection, the trends exhibited through several model applications may be extremely valuable in providing insight as to the best available option for solving particular manpower problems.

B. CURRENT VP DATA

Appendix F contains a printout of a typical computer session involving seatour opportunity calculation for VP aviators under existing conditions of billet structure and tour positions. Current data for pilot only, NFO only, and aggregate categories are included. Program instructions and data display are provided to familiarize the reader with current VP data, based on information received from sources previously cited in Section VI.

Seatour opportunity results for the aggregate category disclose substantial shortfalls for first tour aviators in all projected fiscal years, particularly during the 1981 to 1983 period. Such findings reflect the existing and projected status of first tour VP squadron manning, as indicated in Ref. 2. Of additional importance is the predicted shortfall in manpower for department head positions (Tour 3), especially beginning with 1983. This forecast is probably attributable to the recent, increased attrition among members of year groups which will be in position for such tours after 1983.

Even though a shortfall of 12 percent is projected in 1985, seatour opportunities in tour 2 are quite high for the

1980 to 1984 period, averaging 90 percent. Tour 4, representing VP-related executive and commanding officer positions, maintains an average seatour opportunity of 62 percent over the 1980 to 1985 period. Although a considerable increase is projected between 1980 and 1982, major command (Tour 5) opportunities are understandably lower and average 27 percent through 1985.

Seatour opportunity results for pilots reveal major shortfalls in the first tour position for all projected years. Disassociated sea duty assignments (tour 2) can be filled through 1983, but shortages will occur thereafter. Results additionally indicate that department head billets will become increasingly difficult to fill after 1982. Command opportunities seem slightly higher than normal; however, when the effects of recent pilot attrition are considered, these figures seem more reasonable.

Results of current data for NFOs also show major shortages in the first tour position. Fulfillment of second tour requirements will pose no problem during the 1981 to 1984 period, when opportunities for this tour are quite high. However, shortages are projected for tour 3 prior to 1983. NFO command opportunities seem extremely high for tour 4, but the effects of pilot attrition may be the cause for this unexpected result.

Current data for aggregate, pilot only, and NFO only categories are analyzed to determine effects of changes in

billet requirements and tour positions on seatour opportunities. Upon completion of data alterations for each category, resultant seatour opportunity matrices should be compared with respective matrices representing current data results. This makes it possible to analyze the effects of various changes on seatour opportunities.

C. BILLET REQUIREMENT ALTERATIONS

Selection of utilization alternatives and distribution options is constrained by mandated billet requirements which are essential for fulfillment of defense manning objectives. Of particular concern to the Navy are sea duty assignments involving deployable ships, squadrons, and supporting staffs. Having traditionally been afforded the highest priority, such assignments require a concerted effort on the part of manpower managers to insure they are adequately filled. Manpower requirements for sea duty assignments will vary, depending on the rate of hardware acquisitions and disposals. Alterations in numbers of ships and squadrons will dictate changes in billet requirements which, in turn, require modifications in manpower policies to insure efficient fulfillment of elimination of such requirements.

When applying the VP SEATOURS model for the purpose of testing billet requirement alternatives, the analyst must proceed with caution to insure that selected changes provide

available manpower with requisite rank, experience, and training to fill newly established billets. When shifting billet requirements between tour positions, it is also important to insure that any additional manpower burden can be sufficiently absorbed by that position in which new billets are placed.

The two methods of altering billet requirement data using the VP SEATOURS model are presented below. Specific examples representing tests of feasible alternatives are included for each case. Appendices F and G should be referenced since they contain printouts of the current data and results and the computer sessions in which the specific changes were made.

1. Sea Duty Assignment Changes

Change I for the aggregate category shows the effects of increasing the number of aircraft carriers (CV), amphibious ships (AMPHIB), and service force units (SERVF). Commencing in fiscal year 1981, an aircraft carrier is added to increase the total of these units to 14. The average number of amphibious ships on which VP aviators may serve is increased by one in 1981, 1982, and 1983 and remains at 10 thereafter. Service force units are increased by two in 1981 and again in 1982 to give a total of 7.

When compared with the corresponding matrix for current, aggregate data in Appendix F, the new matrix reveals an increase in seatour opportunities after 1980 with projected

shortfalls in 1984 and 1985 for the second tour position. Commencing in 1981, the tour 5 position also shows increases in seatour opportunities resulting from expansion in major sea command positions now available through addition of these ships.

A reduction in aviation squadrons due to decommissioning miscellaneous, special mission units is illustrated with Change II in Appendix G. In this example, the decommissioning of VC-2 [Ref: 2] is considered with an additional elimination of VXE, VXN, and several VR/VRF units. Implementation of this option would enable more VP aviators to fill second tour assignments on ships or seagoing staffs or to return to operational VP squadrons for augmentation purposes. Results indicate that second tour opportunities are reduced, third tour shortfalls are improved in a small degree because of a decrease in department head requirements, and fourth tour opportunities are decreased due to the elimination of several executive and commanding officer billets.

2. Billet Structure Changes

Change III depicts the option of altering billet requirements by specific tour positions. Using pilots only in this example, billets in the disassociated seatour position (tour 2) are increased to demonstrate the effects of additional pilot utilization on ships and in seagoing staffs. Results included in Appendix G show that employment of this option

would prove detrimental in that considerable shortfalls would occur over all projected fiscal years in tour 2. It is clear that the projected pilot manpower supply could not sufficiently support these additional requirements.

Change IV illustrates the effect of the opposite alteration for pilots. In this case, second tour billet requirements are reduced, allowing for pilot utilization in more critical assignments, such as training command instructor billets or augmentation of operational VP squadrons which currently maintain shortfalls in the first tour position. Results in Appendix G display the consequences of this alteration: a substantial reduction in the second seatour opportunities.

Change V is an example of billet structure alteration by sea duty assignment for the aggregate category. In this case, billets are reduced in operational VP squadrons as a result of a decrease in mandated, aircrew requirements. First tour billets are changed to 40, third tour to 4, and fourth tour (XO/CO) are maintained at 2. Comparison of the resultant seatour opportunity matrix with current data in Appendix F reveals that this option would eliminate all shortfalls in the department head tour (tour 3) and all but three in the first tour position for the six fiscal years projected. Remaining manpower deficiencies during the 1981 to 1983 period for tour 1 are greatly reduced, thereby relieving some of the manpower burden currently existing in operational squadrons.

D. TOUR POSITION ALTERATIONS

The relative position of specific sea duty tours for VP aviators were previously depicted in Figure 9. Application of the VP SEATOURS model incorporates tour parameters for start and duration in conjunction with rank requirements for each seatour position. Manipulation of these parameters affords the analyst with an opportunity to examine various career development paths so that viable alternatives can be determined.

Adjustments in tour positions must be undertaken with caution to properly consider training, experience, rank, and other requisites pertinent to those tours being altered and others which may be affected by such changes. For example, moving the major sea command tour (tour 5) to an earlier start position of 20 years of service would not be feasible, based on current policy, unless commanders would be considered eligible for billets which now specify the rank of captain.

Tour position alterations may affect seatour opportunity in several ways. Increasing tour duration provides additional officers to fill billets within that tour; however, such a change may have important effects on the starts and durations of following tours. Addition or deletion of tour positions in the career development path must be conducted with consideration of adjacent tours. Placing a new tour in the later years

of the career structure may push following tours into those years of service which are relatively lean in manpower supply, resulting in shortfalls for the later tours.

Of additional significance in the manipulation of tour positions is the consequences to adjacent shore assignments. Prior to altering sea duty tours, consideration must be given to the effects on shore duty requirements, required start times and durations of such tours, and the importance of these tours in the career structure. For example, a situation may exist where a determination must be made as to whether time in a subsequent shore assignment should be sacrificed for an extension in a preceding sea duty assignment. Several applications which follow obviously affect adjacent shore duty assignments. As previously noted, exclusion of shore billets limits the scope of the model. Although the model currently focuses on the important, operational sea duty assignments, future integration of shore requirements will provide a more complete analysis of the VP community.

Tour position adjustments are illustrated below with examples for each case. Appendix H includes sample computer sessions in which relevant alterations were conducted. Once again, sea-tour opportunity results must be compared with benchmark matrices in Appendix F.

1. Tour Start and/or Duration Changes

Change VI shows the effect of increasing the length of the combined executive (XO) and commanding officer (CO) tour

(tour 4) from 2 to 3 years for the aggregate category. Implementation of this option would have the effect of lengthening the time as XO and CO to 1-1/2 years each, and result in an overall reduction in command opportunity for certain year groups. If year groups approaching the command position are relatively small in number, causing an unusually high command opportunity, increasing tour length can provide a means of enforcing greater selectivity upon those available. Comparison of the results of this change with the results in Appendix F reveals that seatour opportunity is reduced by an average of 17 percent in tour 4 over the projected fiscal years.

Change VII illustrates tour changes for the first and third tour positions for pilots only. This alternative is an important one to consider in light of current shortfalls in manning VP operational squadron billets. Although implementation of this option would drastically shorten following shore assignments, such a sacrifice may be required in order to meet operational requirements. In this example tour 1 duration is increased by one year and tour 3 is commenced one year earlier (11th year) and extended to 3 years. Results in Appendix H disclose that this option would substantially reduce shortfalls in tour 1 for the 1980 to 1983 period and eliminate deficiencies in 1984 and 1985. Similarly, shortfalls in the department head tour (tour 3) are eliminated in the 1980 to 1982 period and decreased in the 1983 to 1985 period.

A comparable situation is analyzed for NFOs in Change VIII. The first and third tours are changed in exactly the same manner as above for the purpose of mitigating manpower shortfalls. By referring to Appendix H, it is evident that this alteration greatly improves the manpower predicament of the NFO community, particularly in the department head tour where all shortfalls are eliminated.

2. Tour Alteration by Addition of New Tours

Change IX presents for the aggregate category the option of including an additional operational flying tour between tours 2 and 3. Beginning at the 9-1/2 year point, this tour would immediately follow the disassociated seatour assignment (tour 2) and replace the shore assignment which normally fills the 2-1/2 years prior to the department head tour (now tour 4). Even though this option would force some individuals to forego the usual shore assignment, it would provide additional flying experience and assist in offsetting first tour shortfalls in squadron manning. In this example, VP squadron billets for the first tour are reduced from 50 to 45 with the difference becoming the billet requirement for the new tour (tour 3). The five new billets must be added for tour 3 under the VP sea duty assignment category, with zeros entered for the other sea duty assignments. Results in Appendix H indicate that this alternative would decrease manpower shortfalls in the first tour and provide for reasonable seatour opportunity in the new tour 3 for all projected years.

In the VP aviation community the executive and commanding officer assignments for operational squadrons occur during a two -year tour, of which the first year is the XO, the second year the CO tour. Change X illustrates the effects of separating these assignments into two, distinct tours with a shore duty assignment included between them. To accomplish this change the executive officer tour (tour 4) is moved to an earlier start point at 14-1/2 years of service, immediately following the department head tour (tour 3). Duration of this new tour is established at 1-1/2 years. The commanding officer tour (tour 5) is added to commence at the 17-year point with a duration of 1-1/2 years. Billet requirements are then adjusted for each of these new tours.

As depicted in Appendix H, implementation of Change X for both executive and commanding officer positions would provide seatour opportunities which are comparable to those currently experienced. One disadvantage of such a change would be the elimination of continuity in the top two billets by obviating the executive officer's direct move into the commanding officer position in the same squadron. However, advantages of this option would be the opportunity to serve as XO at a relatively early point in an officer's career, and having more time in both positions in possibly different squadrons.

E. CONCURRENT ALTERATIONS TO MEET OPERATIONAL REQUIREMENTS

The following applications are designed to illustrate model diversity through several combinations of changes for the purpose of fulfilling current requirements and eliminating manpower shortfalls. One example is presented for each of the pilot, NFO, and aggregate categories.

1. Pilot Category

Change XI incorporates the following alterations for pilots only:

a. First tour length is extended by one year and the third tour is commenced at 11 years of service and lengthened to three years.

b. Billet requirements in the second tour position are altered to provide 3 additional billets for augmentation purposes in operational VP squadrons, while reducing requirements in ships, seagoing staffs, and disassociated squadrons.

c. Billet structure of operational VP squadrons is changed to reduce first tour billets from 31 to 28, add the 3 billets for tour 2, and reduce tour 3 billets by 1.

Results in Appendix I show that employment of these alterations would succeed in meeting nearly all pilot billet requirements. Extremely small deficiencies of one percent still prevail for tour 1 in 1981 and tour 3 in 1984. The only significant shortfall exists in tour 2 for fiscal year 1985 (11 percent).

2. NFO Category

Change XII involves several changes for NFOs only, as enumerated below:

a. Billet requirements in operational VP squadrons are reduced from 19 to 16 in the first tour and from 3 to 2 in the third tour. Three billets are added in the second tour position for augmentation.

b. Second tour billet requirements are reduced in disassociated squadrons, ships, and seagoing staffs to accommodate the addition of 3 billets to each operational VP squadron.

c. First tour duration is increased to 4 years, while the third tour is moved up to 11 years and lengthened to 3 years.

This combination of changes provides the results depicted in Appendix I for NFOs. First tour shortfalls are eliminated in 1980, 1984, and 1985, while those in the remaining years are greatly diminished. Shortages in the second and third tours are completely eliminated through 1984. Deficiencies remaining in tour 1 could be reduced further by an additional shift of first tour billet requirements to second tour positions. However, caution is required since such action may obviously create shortfalls in the second tour position.

3. Aggregate Category

Change XIII analyzes seatour opportunities for all VP officers by application of the following changes:

a. Billet requirements in each VP squadron are reduced to 42 billets for first tour and 5 billets for third tour positions.

b. Second tour requirements are altered to provide 5 billets to operational VP squadrons for augmentation. A consequent reduction in billet requirements for ships, seagoing staffs, and disassociated squadrons is completed to allow more aviators to return to operational squadrons during this tour.

c. The first and third tour position starts and durations are changed in the same manner as for Changes XI and XII above.

Appendix I displays these alterations and associated results. All manpower requirements are filled for the 1980 to 1984 period. Only a very minor shortage remains in the second tour position in 1985. All seatour opportunities seem reasonable for each tour position. Implementation of this combination of changes is based on the assumption that manning operational VP squadrons would take precedence over other current billet requirements. Those billets not filled in ships, seagoing staffs, and disassociated squadrons would, out of necessity, be "gapped" or filled by officers of other communities, if not completely eliminated.

In summary, the applications presented in this section have demonstrated the utility of the VP SEATOURS model. The advantage of its use lies in the ability to provide a more complete understanding of the impact of billet requirement and

tour position changes upon available manpower. The analysis has been designed to offer options which could realistically be considered in existing scenarios for the purpose of improving manpower management within the VP community.

VIII. CONCLUSIONS AND RECOMMENDATIONS

Efficient utilization of available officers through application of effective professional development programs will be of paramount importance in the manpower environment of the 1980s. Management of extremely complex manpower systems, such as that of the U. S. Navy, can be improved considerably through use of advanced, automated techniques which provide the opportunity for achieving comprehensive, accurate, and timely analysis of alternatives to existing manpower policies. When equipped with this capability, analysts are better prepared to forecast effectively trends in manpower policies which dictate employment of valuable, and often dwindling resources.

Development of an interactive computer model for a specific manpower system must incorporate a thorough examination of the nature of the system to determine input parameters which are essential for accurate simulation. Accuracy of the model's output is critically dependent upon the input data. However, integration of an interactive system in the manpower management process must insure that simplicity is not sacrificed for a perceived need to include all available information. Advanced manpower planning methods must be simple enough for regular, general use and capable of providing results which are easy to interpret and apply.

This research has presented an analysis of one small segment of the U. S. Navy manpower system. The purpose has been to

concentrate on professional development within the VP aviation community and establish relevant criteria for application of a seatour opportunity model which can be of benefit to aviation manpower analysts.

An historical billet and career path analysis proved useful in defining those billets and career sequences which are common to VP aviators. A frequency distribution analysis and a conditional probability computation enabled comparison of specific billets and career paths for categories of command selectees and nonselectees. This enhanced recognition of those billets and billet sequences which improve or limit command selection opportunity for the year groups examined. Of equal importance was the identification of those assignments and necessary flowpoints which are essential to VP officer professional development. Such information served as a basis for structuring a model for the VP community.

The VP SEATOURS model is a versatile tool which has potential for greatly improving manpower planning within the VP aviation community. Armed with the ability to "test" alternative manpower policies, VP managers may be able to detect trends in current resource employment which require intelligent alteration or immediate remedy. Although not a precise prediction for the future, the seatour opportunities output is indicative of trends in VP officer management. When viewed in proper context, this information can be extremely valuable to manpower planners.

Model applications presented in this research are designed to exhibit model versatility and illustrate alternatives which could be feasible options for improving current manpower situations. If the model is applied by aviation manpower analysts who have readily accessible, accurate input data, necessary alterations can be made to accommodate analysis of alternatives currently under consideration.

The model cannot possibly include every aspect of current manpower planning. Simulation of manpower systems invariably involves many limitations and assumptions. Although useful for planning purposes in its current state, the VP SEATOURS model may be improved through implementation of the following considerations. These recommendations are pertinent for improvement of future, similar analyses, as well as the model itself:

1. The methodology and analysis conducted in this research can be applied to other aviation communities with the goal of establishing manpower planning models for each.

2. Through integration of shore duty assignments the VP model could provide a more complete and accurate reflection of total VP manpower requirements. The scope of the model would be expanded to enable analysis of the entire career structure. Incorporation of this feature would also improve model sensitivity to changes in manpower utilization policies.

3. Model versatility would be enhanced by including a method for easier alteration of officer inventory to account

for changes in accessions and continuation rates. This would allow for timely changes in manpower inventory to account for unanticipated fluctuations in available supply.

Implementation of these recommendations could provide models with greater capability for analyzing manpower problems of much broader scope. For example, the options presented in the 1979 URL aviation study [Ref:13] could be examined thoroughly to determine the feasibility of employment and the long range effects on current policies. The following alternatives to aviation manpower planning could be readily analyzed:

1. The effect of NFO transitions to pilot status in several aviation communities.
2. The effect of establishing an aviation generalist community to assume administrative assignments currently maintained by pilots.
3. Consequences of increasing pilot supply through a flying limited duty officer (LDO) program and accession of women pilots.
4. Planning for viable career development paths for women aviators.
5. The effect of changes in the pilot training rate.
6. The effect of increased attrition among middle grade aviation officers.

The manpower environment of the 1980s will most likely prove to be increasingly dynamic, complex, and challenging. Effective utilization of available resources will require timely, absolute, and decisive reaction to various manpower problems. Development of improved methods for accurately analyzing and forecasting effects of alternatives to manpower planning is critically important. There is no doubt that employment of such methods would provide a desperately needed dimension to manpower planning within the U. S. Navy.

APPENDIX A

Sample Format of VP Officer Data

Current Grade	Promotion Status	Year Group	Current Designator	Commissioning Source Code	Active Commission Base Date	Command Selection Status	Date of Current Billet	Current Billet	Promotion History Dates	Navy Officer Billet Code	Ship Station Identification Code	Tour Start Date	Tour Termination Date	Billet History
H	SO	580	1 10	010	580604	3A31Z	7707	CHIEF STF OFF	******	9015	09S	7707		PWING 5
									580604	8670	15D	7505	7607	VP 26
									591204	8672	15D	7102	7505	VP 30
									620601	8680	15D	6901	7101	COM FAW 3
									670101	8656	15D	6612	6812	VP 10
									730701	8685	09B	6501	6607	TRARON 2
										8696	15D	6307	6501	TRARON 3
												6002	6307	VP 7
I		650	1310	010	650609		7902	A/C ORGMNT GEN	******	8190	15D	7802		VP 5
									650609	8656	15D	7410	7708	NAVAL ACAD
									661209	3255	98C	7207	7409	CVA 64CONSTEL
									680701	9225	10B	6708	7001	VP 46
									730901	8674	15D			
										8925	15D			
H		610	1320	081	600811	5A31Z	7805	SQUADRON CO	******	8670	15D	7703		VP 16
									600823	8672	15D	7406	7608	VP 45
									620223	8680	15D	7112	7406	VP 30
									640901	8190	15D	6912	7112	VP 49
									690701	8696	15D	6808	6907	ASW GROUP 5
									760401	8604	15D	6507	6808	OPNAV
										9021	08D	6308	6507	VX 6
												6104	6307	VW 13
H	F89	570	1310	080	570301		7608	DEPUTY DIR	******	9085	58N	7404		NADCNAF WARMINST
									561101	6717	58N	7003	7403	COM THIRD FLEET
									580401	9065	09H	6802	7002	VP 8
									601001	9040	08K	6403	6511	CVS 9 ESSEX
									650901	8685	08K	6011	6310	VP 30
									700801	2615	15D	5705	6010	VP 26

APPENDIX A (CONT.)

Sample Format of Additional Officer Data

Current Grade	Promotion Status	Year Group	Current Designator	Commissioning Source Code	Active Commission Base Date	Command Selection Status	Date of Current Billet	Current Billet	Institution of Most Recent Education	Date Completed Most Recent Education	Subspecialty Designation Codes	Subspecialty Utilization Codes
I		650	1310	040	650125	9A31Z	7903	STFREDI WEP/N	MONTEREY	73	6042P4044S	KAAD
		414760642595760601800711104										
I	S9	640	1310	010	640603	8A31Z	7904	SQUADRON OPS	USNA	64	7026Q4044S	BDA
		206740304414730643										
H		610	1310	060	601216	5A31Z	7906	TRN PLN AV/VP/			4044S	
		414760642595760601548610407514610208										
H		630	1310	040	650529	8A31Z	7905	SQUADRON XO	U TEXAS	65	0095P	*AAA
		205750906400750121										

Note. The second line in each of the above cases is a chronological account of those professional schools undertaken by each individual. A three digit code specifying type of school is followed by date of completion.

APPENDIX B

USEFUL SECTIONS of the Navy Officer Manpower and Personnel Classifications Manual (NAVPERS 15839D)

Volume I: Part A - Navy Officer Billet Classifications (NOBC)
Part B - Billet and Officer Designator Codes, Designator Advisors, Role and Responsibilities of Officers, Officer Grade Codes
Part E - Subspecialty Codes
Part H - Ship and Station Codes
Part K - Service School Course Codes

Volume II: Item No. 4 - Designators, Officer
Item No.10 - Previous Military Service Codes
Item No.24 - Source Codes
Item No.37 - Promotion Status
Item No.33 - Aviation Billet Indicators
Item No.52 - Service School Codes
Item No.58 - Level of Educational Achievement Codes
Item Nos. 66-68 - Subspecialty Codes
Item Nos. 79 & 91 - Subspecialty Utilization Codes
Item Nos. 81 & 91 - Ship and Station Codes
Item Nos. 83, 86, 89 & 91 - Navy Officer Billet Classification Codes
Item No. 103 - Command Screen Results Codes

APPENDIX C

SAMPLE FORMAT OF BILLET HISTORY DATA FILE

Case Number	Billet History By Tour Position								Selectee(1) Nonselectee (2)	Dept. Head Billet	Commission-ing Source	Flight Hours
024	S3	D1	I1	F1	S2	I2	TO		1	M	080	6689
122	S3	D1	I2	S3	P1	F1	TO		2	0	030	4403
113	S3	D1	U1	F2	P1	F1	TO		1	M	040	5505
036	S3	D1	U1	F2	I2	P1	F1	TO	1	0	010	6384
068	S2	D1	U1	P2	S2	P1	I3	TO	1	M	010	2999
080	S3	D1	U1	B2	I3	F1	TO		1	0	030	4070
138	S]	D1	S2	B2	P1	F1	TO		1	A	030	3608
101	S3	D1	S]	F2	I2	F1	TO		2	0	081	0000
143	S3	D1	S2	F2	F1	I2	TO		1	0	030	4819
061	S3	D1	S3	F2	I2	F1	TO		2	0	030	9391
103	S3	D1	S2	P1	I3	F1	TO		1	M	010	3057
091	S2	D1	S2	P2	F2	F1	TO		1	M	010	4290
106	S2	D1	S3	P1	F1	TO			1	M	010	4528
043	S1	D1	S2	S2	I2	F1	TO		1	M	080	5997
039	S2	D1	S3	S1	F1	TO			2	M	080	5555
005	S1	D1	P2	R1	S1	F2	F1	TO	1	M	400	4592
070	S2	D1	P2	S1	B2	I1	F1	TO	1	0	030	3855
146	S3	D1	P2	I1	S2	P1	F1	TO	1	M	040	3466
031	S3	D1	B2	U1	P1	F1	TO		1	M	040	5591
131	S3	D1	B2	P1	I2	F1	TO		1	0	010	5082
053	S3	D1	B1	P2	I1	F1	TO		1	0	010	3727
121	D1	P2	B2	P1	S1	F1	TO		1	0	030	5109
076	D1	P2	S1	F2	F1	TO			2	M	041	4257
085	D1	P2	I1	F2	F1	S3	TO		1	S	380	5113
129	D1	P2	B2	P1	F2	F1	TO		2	S	010	3133
109	D1	P1	B1	I1	F1	TO			1	0	050	5696
082	D1	I3	P2	U1	P1	F1	TO		1	A	010	3740
114	D1	B3	B2	I1	F1	TO			1	0	381	3604
140	D1	B2	P2	S3	I1	F1	TO		1	0	030	3803
081	P2	D1	S2	I1	F2	F1	TO		1	M	020	5799
047	P1	D1	S2	P1	F2	F1	TO		1	0	030	6369
079	P2	D1	S1	B2	P1	F1	TO		2	X	040	4223
008	P2	D1	S1	B2	I3	F1	TO		1	0	040	3687
001	P2	D1	S2	B2	I1	F1	TO		1	0	010	4142
144	P2	D1	P2	B2	P1	F1	TO		1	S	040	3948
110	U1	P2	D1	B2	U1	P1	F1	TO	2	M	010	4588
119	U1	P2	D1	I3	F1	TO			1	X	010	4299
073	U1	P2	D1	S3	P1	F2	F1	TO	1	0	010	5983
026	U1	P2	D1	B2	P1	I1	F1	TO	1	M	010	4854
014	U1	P2	D1	B1	P1	S1	F1	TO	1	0	080	0000
002	U1	P2	D1	B1	I3	P1	F1	TO	1	A	010	4982
115	I1	D1	B2	I1	P1	F2	F1	TO	2	0	080	7203
006	I1	D1	B2	I1	F1	TO			1	0	020	5135

APPENDIX D

Sample Application of Bayes' Theorem for Determination of Conditional Probabilities

Bayes' Theorem was applied to each of the billet categories in Section III using the following equation for conditional probability determination [Ref:6]:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B|A)P(A) + P(B|A^c)P(A^c)}$$

Using the B2 category for pilots as an example, variables were redefined and included in the equation as follows:

$$P(S|B2) = \frac{P(B2|S)P(S)}{P(B2|S)P(S) + P(B2|S^c)P(S^c)}$$

where,

$P(S)$ = probability of command selection.

$P(S^c)$ = probability of nonselection.

$P(S|B2)$ = probability of selection given that a B2 tour had been completed.

$P(B2|S)$ = probability of having completed a B2 tour given that selection had occurred.

$P(B2|S^c)$ = probability of having completed a B2 tour given that selection had not occurred.

For the specific example the following probabilities were computed and assigned:

$P(S) = .41$ $P(B2|S) = .48$

$P(S^c) = .59$ $P(B2|S^c) = .64$

APPENDIX D (CONT.)

Substitution of these into the following equations yields the joint probability of having a B2 tour for pilot selectees and nonselectees:

$P(B2 \text{ and } S) = P(B2|S)P(S) = .20$

and

$P(B2 \text{ and } S^c) = P(B2|S^c)P(S^c) = .38$

Since the joint probabilities are known, the marginal probabilities can also be determined to complete the following joint probability table:

		S		
		Y	N	
B2	Y	.20	.38	.58
	N	.21	.21	.42
		.41	.59	1.00

APPENDIX E

VPTOURS COMPUTER PROGRAM

```
      ∇VPTOURS[⎕]∇
    ∇ I̲ VPTOURS YEAR;BRANCH;CHOICE;B;C;D;E;I;J;N̲;M̲;R;S;Z;BB;HH;RR;XX;ZZ;BD;AA
[1]    J←0
[2]   START:ZZ←SHIPS
[3]    BD←TOURS
[4]    AA←BILLETS
[5]    R←(ρZZ),ρTSUPPLY
[6]    →(I̲≤R[2]⌊R[4])ρPASS
[7]    'YOU HAVE REQUESTED SEATOUR OPPORTUNITIES FOR TOO MANY YEARS FOLLOWING START DATE'
[8]    'THERE IS NOT ENOUGH DATA IN THIS WORKSPACE TQ SUPPORT THE CALCULATIONS'
[9]    →0
[10]  PASS:ZZ←((I̲ρ1),(R[2]-I̲)ρ0)/ZZ
[11]   R←(ρZZ)[1]
[12]   S←(ρBD)[2]
[13]   N̲←⌈+⌿ 2 ¯1 ↑BD
[14]   M̲←1↑ρTSUPPLY
[15]   →(N̲>M̲)ρE1
[16]   →((ρAA)[2]≠(ρBD)[2])ρE1
[17]   A̲←SHP
[18]   LF
[19]   →JρL0
[20]   'A MODEL FOR ANALYSIS OF THE PROFESSIONAL DEVELOPMENT PATH'
[21]   '      OF THE VP(MARITIME PATROL) AVIATION COMMUNITY '
[22]   LF
[23]   →(~ANS 'DO YOU WISH TO SEE THE INSTRUCTIONS')ρL0
[24]   'THIS PROGRAM CALCULATES SEA TOUR OPPORTUNITIES OR SHORTFALLS'
[25]   'IT USES FOUR(4) SETS OF DATA'
[26]   LF
[27]   '      SEA DUTY ASSIGNMENTS BY TYPE PER YEAR'
[28]   '      POSITION OF SEATOURS W/R TO TIME IN SERVICE'
[29]   '      BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TYPE'
[30]   '      SUPPLY OF OFFICERS PER RANK AND YEARS OF SERVICE'
[31]   LF
[32]   'NORMALLY THE VALUES OF THE SEATOUR OPPORTUNITY TABLE WILL SHOW'
[33]   'THE CHANCE OF BEING ASSIGNED TO A SEATOUR FOR OFFICERS WITH'
[34]   'COINCIDENT TIME IN SERVICE'
[35]   'IF THE VALUE IN THE TABLE IS IN PARENTHESES IT MEANS'
[36]   'THE TOUR IS UNDERMANNED, AND THE VALUE IS THE PERCENTAGE'
[37]   'BY WHICH THE TOUR IS SHORT'
[38]   LF
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COMPUTER PROGRAM CONT.

```
[39]  'OFFICER SUPPLY IS CALCULATED ONLY FROM OFFICERS WITH RANK'
[40]  'AT OR ABOVE THE NORMAL RANK ASSOCIATED WITH EACH TOUR'
[41]  'HOWEVER, TOTAL SUPPLY DISPLAYED INCLUDES OFFICERS WITH'
[42]  'RANK LOWER THAN REQUIRED FOR CERTAIN TOURS'
[43]  LF
[44]  'OPTIONS:'
[45]  'YOU CAN DISPLAY THE DATA,ALTER THE DATA,OR LET THE PROGRAM CALCULATE'
[46]  'THE SEA TOUR OPPORTUNITIES DIRECTLY'
[47]  LF
[48] L0:'DISPLAY DATA BY TYPING                               D̲I̲S̲P̲L̲A̲Y̲'
[49]  'ALTER DATA BY TYPING                                C̲H̲A̲N̲G̲E̲'
[50]  'FOR DIRECT CALCULATION OF SEA TOURS TYPE    S̲E̲A̲T̲O̲U̲R̲'
[51]  BRANCH← 3 7 ⍴'DISPLAYCHANGECSEATOUR'
[52]  →(+/B←,BRANCH∧.=CHOICE← 7 1 ⍴CHOICE←⍞)⍴L1
[53]  'INCORRECT INPUT'
[54]  LF
[55]  →L0
[56] L1:→B/L2,L3,L4
[57] L2:DISPLAY 0
[58]  →(ANS 'ALTER ANY DATA?')⍴L3
[59]  →L4
[60] L3:ALTER
[61]  →(~ANS 'DO YOU WANT ALL CHANGES MADE PERMANENT?')⍴QUIT
[62]  I←I̲-(⍴SHIPS)[2]
[63]  SHIPS←ZZ,(((⍴SHIPS)[1]),I)↑SHIPS
[64]  TOURS←BD
[65]  BILLETS←AA
[66] QUIT:LF
[67]  →(ANS 'DISPLAY ANY DATA?')⍴L2
[68] L4:→(∨/C←(2≠⍴⍴BD),(2≠⍴⍴ZZ),(2≠⍴⍴AA),(3≠⍴⍴SUPPLY))⍴ERROR
[69]  D←(+/BD)∘.-¯1↓0,⍳U̲
[70]  E←(-BD[1;])∘.+⍳U̲
[71]  D←1⌊D×D>0
[72]  E←1⌊E×E>0
[73]  BB←D⌊E
[74]  XX←INVENTORY BB
[75]  HH←(⍉AA)+.×ZZ
[76]  Z←XX=0
[77]  RR←(~Z)×HH÷XX+Z
[78]  RR←(RR×RR≤1)+¯1+÷(~RR>1)+RR×RR>1
[79]  RR←RR+0=RR←(⌊0.5+RR×100)÷100
[80]  LF
```

COMPUTER PROGRAM CONT.

```
[81]  'REQUIREMENTS FOR VP OFFICERS'
[82]  ''
[83]  '2X,12I10' FMT(¯1+YEAR+⍳I̲)
[84]  'TOUR'
[85]  'I3,I9,12I10' FMT(((S,1)⍴⍳S),NN)
[86]  LF
[87]  'VP OFFICERS AVAILABLE'
[88]  ''
[89]  '2X,12I10' FMT(¯1+YEAR+⍳I̲)
[90]  'TOUR'
[91]  'I3,I9,12I10' FMT(((S,1)⍴⍳S),XX)
[92]  LF
[93]  'NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR'
[94]  'PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED'
[95]  LF
[96]  'VP SEATOUR OPPORTUNITIES OR SHORTFALLS'
[97]  ''
[98]  '2X,12I10' FMT(¯1+YEAR+⍳I̲)
[99]  'TOUR'
[100] 'I3,12M⎕(⎕N⎕)⎕F10.2' ΔFMT(((S,1)⍴⍳S),RR)
[101] LF
[102] J←1
[103] →(ANS 'DO YOU WISH TO CONTINUE')⍴START
[104] →0
[105]ERROR:→C/(E1,E2,E3,E4)
[106]E1:'ERROR IN TOUR POSITION MATRIX'
[107] →0
[108]E2:'ERROR IN SHIP PROJECTION MATRIX'
[109] →0
[110]E3:'ERROR IN BILLET MATRIX'
[111] →0
[112]E4:'ERROR IN SUPPLY MATRIX'
    ∇

      ∇INVENTORY[⎕]∇
    ∇ XX←INVENTORY BB;SUP;V1;V2;V;I;IND
[1]   SUP←(6,U̲,I̲)↑SUPPLY
[2]   V1←(+/BD)∘.> 0 2 4 9 15 21
[3]   V2←BD[1;]∘.< 2 4 9 15 21 30
[4]   V←V1×V2
[5]   XX←(S,I̲)⍴1
[6]   I←1
[7]  LOOP:IND←(1+1↓⍴V)-(IND>0)/IND←V[I;]×⍳⍴V[I;]
[8]   XX[I;]←BB[I;]+.×+/SUP[IND;;]
[9]   →(S≥I←I+1)⍴LOOP
    ∇
```

COMPUTER PROGRAM CONT.

```
    ∇ DISPLAY GO;B;C;DISP
[1]   →GO⍴L1
[2]   LF
[3]   'PROJECTION OF SEA DUTY ASSIGNMENTS BY TYPE FOR ';Y̲;' YEARS            ENTER 1'
[4]   'POSITIONS OF TOURS WRT YEARS OF SERVICE                             ENTER 2'
[5]   'BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TOUR           ENTER 3'
[6]   'SUPPLY OF OFFICERS FOR NEXT ';Y̲;' YEARS BY TIME IN SERVICE           ENTER 4'
[7]   LF
[8]   →SKIP
[9]  TYPE:'ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4'
[10] SKIP:'TYPE NUMBER OF DISPLAY DESIRED'
[11] CHECK:DISP←1↑|DISP←,⎕
[12]  LF
[13]  →(∨/DISP=⍳4)⍴L0
[14]  'INCORRECT INPUT'
[15]  →CHECK
[16] L0:→(1,L1,L2,L3)[DISP]×⍳DISP>1
[17]  '            PROJECTIONS OF SEA DUTY ASSIGNMENTS BY TYPE'
[18]  ''
[19]  '14X,10I6' FMT(¯1+YEAR+⍳Y̲)
[20]  ''
[21]  ' SEA DUTY'
[22]  'ASSIGNMENTS'
[23]  ''
[24]  ''
[25]  'I4,X2,A7  ,12I6' FMT(((R,1)⍴⍳R),ZZ)
[26]  →DECISION
[27] L1:A̲← 2 11 ⍴'TOUR START TOUR LENGTH'
[28]  '                TOUR POSITIONS WRT YEARS OF SERVICE'
[29]  ''
[30]  '⎕TOUR NUMBER⎕,I5,10I7' FMT(⍳S)
[31]  ''
[32]  'A11 ,11BF7.1' FMT(BD)
[33]  A̲←SHF
[34]  →(GO=1)⍴0
[35]  LF
[36]  →DECISION
[37] L2:(20⍴' '),'BILLET REQUIREMENTS'
[38]  ''
[39]  ''
[40]  ' SEA DUTY                      TOUR POSITIONS'
[41]  'ASSIGNMENTS'
[42]  'I18,20I6' FMT(⍳S)
[43]  ''
[44]  'I4,X2,A6 ,12I6' FMT(((R,1)⍴⍳R),AA)
[45]  →DECISION
[46] L3:C← 2 8 ⍴'YEARS OFSERVICE '
[47]  '8X,10I6' FMT(¯1+YEAR+⍳Y̲)
[48]  C
[49]  'I4,I10,10I6' FMT(((M̲,1)⍴⍳M̲),(M̲,Y̲)↑TSUPPLY)
[50] DECISION:LF
[51]  →(ANS 'DISPLAY MORE DATA?')⍴TYPE
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇ALTER[⎕]∇
    ∇ ALTER;T;T
[1]    LF
[2]    'THERE ARE SIX(6) MEANS OF CHANGING DATA'
[3]    LF
[4]    'TO CHANGE NO, OF SEA DUTY ASSIGNMENTS BY TYPE     ENTER 1'
[5]    'TO CHANGE TOUR POSITION VALUES                     ENTER 2'
[6]    'TO ADD NEW TOUR POSITIONS                          ENTER 3'
[7]    'TO DELETE TOUR POSITIONS                           ENTER 4'
[8]    'TO CHANGE BILLETS BY TOUR POSITION                 ENTER 5'
[9]    'TO CHANGE BILLETS BY SEA DUTY ASSIGNMENT           ENTER 6'
[10]   'WHEN YOU ARE FINISHED WITH A CHANGE                ENTER 0'
[11]   LF
[12]   →SKIP
[13]  ENTER:'1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS'
[14]   '      5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT'
[15]  SKIP:'ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE'
[16]  CHECK:T←1↑|T←,⎕
[17]   →(∨/T=⍳6)ρL0
[18]   →(T=0)ρ0
[19]   'INCORRECT INPUT'
[20]   →CHECK
[21]  L0:→(1,L1,L2,L5,L3,L4)[T]×⍳T)1
[22]   SHIPCHG
[23]   →DECISION
[24]  L1:LF
[25]   'YOUR CURRENT TOUR POSITION MATRIX IS:'
[26]   DISPLAY 1
[27]  L11:LF
[28]   'ENTER TOUR NUMBER TO BE CHANGED'
[29]   →(0=T←1↑|T←,⎕)ρDECISION
[30]   →(T≤5)ρFUN
[31]   'INCORRECT INPUT'
[32]   →L11
[33]  FUN:TOURCHG T
[34]   →L11
[35]  L2:TOURADD
[36]   →DECISION
[37]  L3:'ENTER TOUR NUMBER'
[38]   →(0=T←1↑|T←,⎕)ρDECISION
[39]   →(T≤5)ρFCH
[40]   'INCORRECT INPUT'
[41]   →L3
[42]  FCH:BILLCHT T
[43]   →L3
[44]  L4:BILLCHS
[45]   →DECISION
[46]  L5:TOURDEL
[47]  DECISION:→(ANS 'ALTER MORE DATA?')ρENTER
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇TOURCHG[⎕]∇
    ∇ TOURCHG T;U;V;I;J;Y;E̲;Q̲;BDI
[1]    I←1
[2]   START:U←T[I]
[3]    LF
[4]   CHECK:'ENTER NEW VALUES FOR TOUR START AND LENGTH'
[5]    '10X,⎕FOR TOUR NUMBER⎕,I5' FMT(U)
[6]    'BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS'
[7]    →(2=⍴V←,⎕)⍴L0
[8]    'INCORRECT INPUT'
[9]    →CHECK
[10]  L0:BD[;U]←V
[11]   BDI←(BD[1;]≠0)/BD
[12]   →(∧/(¯1↓+⌿BDI)≤1↓BDI[1;])⍴JUMP
[13]   J←1
[14]  LOOP:Y←(¯1↓+⌿BDI)⌈1↓BDI[1;]
[15]   BDI[1;]←BDI[1;1],Y
[16]   →((⍴BDI)[2]>J←J+1)⍴LOOP
[17]   '*************************************************************'
[18]   LF
[19]   '                       WARNING:'
[20]   'YOUR ENTRY HAS AFFECTED ONE OR MORE OF THE O̲T̲H̲E̲R̲ TOUR POSITIONS'
[21]   LF
[22]   '*************************************************************'
[23]   LF
[24]   BD←(BD[1;]≠0)\BDI
[25]   ' TOUR POSITIONS HAVE BEEN UPDATED TO:'
[26]   LF
[27]   DISPLAY 1
[28]   →FINISH
[29]  JUMP:LF
[30]   'YOUR VALUES ENTERED AS:'
[31]   'TOUR NUMBER      START      LENGTH'
[32]   (5⍴' ');U;(12⍴' ');BD[1;U];(9⍴' ');BD[2;U]
[33]   LF
[34]  FINISH:→(M̲≥N̲←+⌿ 2 ¯1 ↑BD)⍴FINALE
[35]   Q̲←+/~E̲←(+⌿BD)≤M̲
[36]   N̲←⌈+⌿ 2 ¯1 ↑BD←E̲/BD
[37]   AA←E̲/AA
[38]   S←(⍴BD)[2]
[39]   ''
[40]   'TOUR POSITION MATRIX HAS BEEN TRUNCATED BY ';Q̲;' POSITIONS'
[41]   'BECAUSE IT WILL NOT EVALUATE BEYOND THE DATA GIVEN IN YOUR SUPPLY MATRIX'
[42]   LF
[43]   'IF YOU WISH TO RECOVER THE LOST TOURS YOU MUST USE THE PROGRAM'
[44]   'THAT ADDS TOURS'
[45]  FINALE:→((⍴T)≥I←I+1)⍴START
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇TOURADD[⎕]∇
    ∇ TOURADD;I;J;T
[1]    LF
[2]    'YOUR CURRENT TOUR MATRIX IS:'
[3]    LF
[4]    DISPLAY 1
[5]    LF
[6]   START:'ENTER CURRENT TOUR NUMBERS'
[7]    '       YOU WANT FOLLOWED BY NEW TOURS'
[8]    'IF YOU WANT TO ADD MORE THAN ONE TOUR BETWEEN ANY TWO CURRENT TOURS'
[9]    'JUST REPEAT THE NUMBER ENTERED AS MANY TIMES AS THE NUMBER OF TOURS'
[10]   'YOU WANT INSERTED'
[11]   →(S<⍴T←,⎕)⍴ERROR
[12]   I←1
[13]  CHECK:→(∧/T[I]≠0,⍳S)⍴ERROR
[14]   →((⍴T)≥I←I+1)⍴CHECK
[15]   J←(S+⍴T)⍴1
[16]   J[T+⍳⍴T]←J[T+⍳⍴T]-1
[17]   S←(¯1↑⍴BD←J\BD)
[18]   AA←J\AA
[19]   LF
[20]   'TOUR POSITIONS REVISED TO:'
[21]   LF
[22]   DISPLAY 1
[23]   LF
[24]   'TOUR START AND LENGTH MUST NOW BE ADDED TO NEW TOURS'
[25]   LF
[26]   TOURCHG(T+⍳⍴T)
[27]   →((⍴J)=1↓⍴AA)⍴SKIP
[28]   →(∧/(T+⍳⍴T)>1↓⍴AA)⍴0
[29]   T←((T+⍳⍴T)≤1↓⍴AA)/T
[30]  SKIP:LF
[31]   'BILLETS MUST BE ADDED FOR NEW TOURS'
[32]   LF
[33]   BILLCHT(T+⍳⍴T)
[34]   →0
[35]  ERROR:'INCORRECT INPUT   READ INSTRUCTIONS'
[36]   →START
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇TOURDEL[⎕]∇
    ∇ TOURDEL;I;J;T
[1]    'YOUR CURRENT TOUR MATRIX IS:'
[2]    LF
[3]    DISPLAY 1
[4]    LF
[5]   START:'ENTER TOUR NUMBERS YOU WANT DELETED'
[6]    'BE SURE AND PUT A SPACE BETWEEN NUMBERS IF YOU ENTER MORE THAN ONE'
[7]    →(S|ρT←,⎕)ρERROR
[8]    I←1
[9]   CHECK:→(∧/T[I]≠0,⍳S)ρERROR
[10]   →((ρT)≥I←I+1)ρCHECK
[11]   J←Sρ1
[12]   J[T]←J[T]-1
[13]   S←¯1↑ρBD←J/BD
[14]   AA←J/AA
[15]   LF
[16]   'TOUR POSITIONS HAVE BEEN UPDATED TO'
[17]   LF
[18]   DISPLAY 1
[19]   LF
[20]   'BILLETS FOR TOURS ';T;' HAVE BEEN DELETED'
[21]   →0
[22] ERROR:'INCORRECT INPUT      READ INSTRUCTIONS'
[23]   →START
    ∇

      ∇BILLCHS[⎕]∇
    ∇ BILLCHS;T;V
[1]   START:'ENTER SEA DUTY ASSIGNMENT NUMBER'
[2]    →(0=T←1↑|T←,⎕)ρ0
[3]    →(T≤R)ρL0
[4]    'INCORRECT INPUT'
[5]    →START
[6]   L0:(25ρ' '),,SHP[T;]
[7]    (20ρ' '),'CURRENT  BILLETS'
[8]    LF
[9]    '⎕TOUR NO⎕,20I8' FMT(⍳S)
[10]   '⎕BILLETS⎕,20I8' FMT(AA[T;])
[11]   LF
[12] L1:'ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO'
[13]   →(S=ρV←,⎕)ρL2
[14]   'INCORRECT INPUT'
[15]   →L1
[16] L2:AA[T;]←V
[17]   (23ρ' '),,SHP[T;]
[18]   (20ρ' '),'NEW  BILLETS'
[19]   ''
[20]   '⎕ENTERED AS:⎕,20I8' FMT(AA[T;])
[21]   LF
[22]   →START
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇BILLCHT[⎕]∇
    ∇ BILLCHT TO;I;T;V;H;C̲H̲
[1]     I←1
[2]   START;T←TO[I]
[3]     LF
[4]     'CURRENT BILLETS ARE'
[5]     ''
[6]     C̲H̲←'TOUR NO.',(' '≠H)/H←,(8ρ','),(8,1↓ρSHP)↑SHP
[7]     'I8,8I9' FMT(Y,8↑AA[;T])
[8]     LF
[9]     C̲H̲←'TOUR NO.',(' '≠H)/H←,(7ρ','),(8,0)↓SHP
[10]    'I8,7I9' FMT(Y,8↓AA[;T])
[11]    LF
[12]  CHECK;'ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT'
[13]    'BE SURE TO ENTER A NUMBER FOR ALL SEA DUTT ASSIGNMENTS EVEN IF REPEATED OR ZERO'
[14]    →(K=ρV←,⎕)ρL0
[15]    'INCORRECT INPUT'
[16]    →CHECK
[17]  L0;AA[;T]←V
[18]    ''
[19]    'NEW BILLETS ENTERED AS;'
[20]    ''
[21]    C̲H̲←'TOUR NO.',(' '≠H)/H←,(8ρ','),(8,1↓ρSHP)↑SHP
[22]    'I8,8I9' FMT(Y,8↑AA[;T])
[23]    LF
[24]    C̲H̲←'TOUR NO.',(' '≠H)/H←,(7ρ','),(8,0)↓SHP
[25]    'I8,7I9' FMT(Y,8↓AA[;T])
[26]    LF
[27]    →((ρTO)≥I←I+1)ρSTART
    ∇
```

COMPUTER PROGRAM CONT.

```
      ∇SHIFCHG[⎕]∇
    ∇ SHIFCHG;T;V
[1]     'ENTER SEA DUTY ASSIGNMENT NUMBER'
[2]   START:→(0=T←1↑|T←,⎕)ρ0
[3]    →(T∊R)ρL0
[4]    'INCORRECT INPUT'
[5]    →START
[6]   L0:(20ρ' '),'CURRENT DATA'
[7]    '8X,10I8' FMT(¯1+YEAR+⍳I̲)
[8]    A̲←SHP[T;]
[9]    'A7 ,10I8' FMT(ZZ[T;])
[10]   A̲←SHP
[11]   LF
[12]  L1:'ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO'
[13]   →(I̲=ρV←,⎕)ρL2
[14]   'INCORRECT INPUT'
[15]   →L1
[16]  L2:ZZ[T;]←V
[17]   LF
[18]   '⎕DATA ENTERED AS:⎕,10I6' FMT(ZZ[T;])
[19]   LF
[20]   'ENTER NEXT SEA DUTY ASSIGNMENT NUMBER'
[21]   →START
    ∇


      ∇ANS[⎕]∇
    ∇ Y←ANS QUEST;B;ANSWER
[1]   L1:QUEST
[2]    (20ρ' '),'ANSWER YES OR NO'
[3]    →(0≠ρANSWER←⍞)ρL2
[4]    'YOU MUST ANSWER'
[5]    →L1
[6]   L2:Y←∨/'Y'=ANSWER
[7]    LF
    ∇
```

APPENDIX F

DISPLAY OF CURRENT DATA

CURRENT DATA FOR AGGREGATE

```
          6 VPTOURS 1980

A MODEL FOR ANALYSIS OF THE PROFESSIONAL DEVELOPMENT PATH
     OF THE VP(MARITIME PATROL) AVIATION COMMUNITY


DO YOU WISH TO SEE THE INSTRUCTIONS
                    ANSWER YES OR NO
YES


THIS PROGRAM CALCULATES SEA TOUR OPPORTUNITIES OR SHORTFALLS
IT USES FOUR(4) SETS OF DATA


     SEA DUTY ASSIGNMENTS BY TYPE PER YEAR
     POSITION OF SEATOURS W/R TO TIME IN SERVICE
     BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TYPE
     SUPPLY OF OFFICERS PER RANK AND YEARS OF SERVICE


NORMALLY THE VALUES OF THE SEATOUR OPPORTUNITY TABLE WILL SHOW
THE CHANCE OF BEING ASSIGNED TO A SEATOUR FOR OFFICERS WITH
COINCIDENT TIME IN SERVICE
IF THE VALUE IN THE TABLE IS IN PARENTHESES IT MEANS
THE TOUR IS UNDERMANNED, AND THE VALUE IS THE PERCENTAGE
BY WHICH THE TOUR IS SHORT


OPTIONS;
YOU CAN DISPLAY THE DATA,ALTER THE DATA,OR LET THE PROGRAM CALCULATE
THE SEA TOUR OPPORTUNITIES DIRECTLY


DISPLAY DATA BY TYPING                           DISPLAY
ALTER DATA BY TYPING                             CHANGE
FOR DIRECT CALCULATION OF SEA TOURS TYPE         SEATOUR
DISPLAY


PROJECTION OF SEA DUTY ASSIGNMENTS BY TYPE FOR 6 YEARS          ENTER 1
POSITIONS OF TOURS WRT YEARS OF SERVICE                         ENTER 2
BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TOUR       ENTER 3
SUPPLY OF OFFICERS FOR NEXT 6 YEARS BY TIME IN SERVICE          ENTER 4


TYPE NUMBER OF DISPLAY DESIRED
⎕:
      1
```

CURRENT DATA FOR AGGREGATE CONT.

```
                PROJECTIONS OF SEA DUTY ASSIGNMENTS BY TYPE

                        1980  1981  1982  1983  1984  1985

  SEA DUTY
 ASSIGNMENTS


   1  VF                 24    24    24    24    24    24
   2  VFSD                2     2     2     2     2     2
   3  VXE                 1     1     1     1     1     1
   4  VXN                 1     1     1     1     1     1
   5  VC                  3     3     3     3     3     3
   6  VR/VRF              3     3     3     3     3     3
   7  FEP                 5     5     5     5     5     5
   8  CV                 13    13    13    13    13    13
   9  AMPHIB              7     7     7     7     7     7
  10  SERVF               3     3     3     3     3     3
  11  CARGRU              8     8     8     8     8     8
  12  TSC                 8     8     8     8     8     8
  13  NAVFAC              7     7     7     7     7     7
  14  CRUDGR              6     6     6     6     6     6
  15  PATWING             4     4     4     4     4     4

DISPLAY MORE DATA?
                         ANSWER YES OR NO
YES


ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
⎕:
      2

                  TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER       1        2        3        4        5

TOUR START       2.0      7.0     12.0     16.5     21.0
TOUR LENGTH      3.0      2.5      2.5      2.0      2.0


DISPLAY MORE DATA?
                         ANSWER YES OR NO
YES
```

CURRENT DATA FOR AGGREGATE CONT.

```
ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
Q:
      3


                    BILLET REQUIREMENTS


 SEA DUTY                    TOUR POSITIONS
ASSIGNMENTS
                      1     2     3     4     5

  1   VP             50     0     7     2     0
  2   VPSD            0     9     0     0     0
  3   VXE             0     3     2     1     0
  4   VXN             0     3     2     1     0
  5   VC              0     1     1     1     0
  6   VR/VRF          0     4     0     3     0
  7   FEP             0     3     0     0     0
  8   CV              0    10     0     0     0
  9   AMPHIB          0     2     0     0     1
 10   SERVF           0     1     0     0     1
 11   CARGRU          0     2     0     0     0
 12   TSC             0     8     0     1     0
 13   NAVFAC          0     1     0     1     0
 14   CRUDGR          0     1     0     0     0
 15   PATWIN          0     0     0     0     1

DISPLAY MORE DATA?
                    ANSWER YES OR NO
YES


ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
Q:
      4
```

CURRENT DATA FOR AGGREGATE CONT.

```
              1980  1981  1982  1983  1984  1985
YEARS OF
SERVICE
   1           207   207   207   207   207   207
   2           234   400   400   400   400   400
   3           306   230   391   391   391   391
   4           337   291   222   372   372   372
   5           333   267   229   177   293   293
   6           282   235   193   163   116   207
   7           171   206   167   140   117    74
   8           127   145   174   139   118    97
   9           129   120   134   156   126   112
  10           109    96    84    99   117    92
  11           140    97    85    75    89   105
  12           129   126    87    77    71    84
  13           100   123   120    84    74    68
  14            95    78    96    94    70    70
  15            81    71    63    79    77    54
  16            71    79    70    61    77    75
  17            61    68    75    66    58    73
  18            63    58    65    72    63    56
  19            50    57    54    60    66    59
  20            44    41    45    38    34    55
  21            37    28    22    26    24    27
  22            45    25    24    22    26    24
  23            35    41    23    22    20    24
  24            35    32    38    21    20    19
  25            19    30    28    32    18    17
  26            21    17    28    25    30    17
  27            10    17    14    23    21    24
  28             7     7    13    10    17    15
  29             2     5     5    10     8    13
  30             4     2     5     5    10     8

DISPLAY MORE DATA?
                         ANSWER YES OR NO


NO

ALTER ANY DATA?
                         ANSWER YES OR NO
NO
```

RESULTS OF CURRENT DATA FOR AGGREGATE

```
REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1       1200      1200      1200      1200      1200      1200
  2        291       291       291       291       291       291
  3        175       175       175       175       175       175
  4         77        77        77        77        77        77
  5         14        14        14        14        14        14


VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        976       788       842       940      1056      1056
  2        311       313       350       345       303       255
  3        171       165       168       132       121       138
  4        119       121       130       135       125       122
  5         80        66        47        44        46        48


NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED


VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
TOUR
  1     (0.19)    (0.34)    (0.30)    (0.22)    (0.12)    (0.12)
  2      0.94      0.93      0.83      0.84      0.96     (0.12)
  3     (0.02)    (0.06)    (0.04)    (0.25)    (0.31)    (0.21)
  4      0.65      0.64      0.59      0.57      0.62      0.63
  5      0.18      0.21      0.30      0.32      0.30      0.29
```

CURRENT DATA FOR PILOTS

```
DISPLAY DATA BY TYPING                        DISPLAY
ALTER DATA BY TYPING                          CHANGE
FOR DIRECT CALCULATION OF SEA TOURS TYPE      SEATOUR
DISPLAY

PROJECTION OF SEA DUTY ASSIGNMENTS BY TYPE FOR 6 YEARS               ENTER 1
POSITIONS OF TOURS WRT YEARS OF SERVICE                              ENTER 2
BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TOUR            ENTER 3
SUPPLY OF OFFICERS FOR NEXT 6 YEARS BY TIME IN SERVICE               ENTER 4

TYPE NUMBER OF DISPLAY DESIRED
⎕:
      1

        PROJECTIONS OF SEA DUTY ASSIGNMENTS BY TYPE

                  1980  1981  1982  1983  1984  1985

 SEA DUTY
ASSIGNMENTS


  1  VF            24    24    24    24    24    24
  2  VFSD           2     2     2     2     2     2
  3  VXE            1     1     1     1     1     1
  4  VXN            1     1     1     1     1     1
  5  VC             3     3     3     3     3     3
  6  VR/VRF         3     3     3     3     3     3
  7  FEP            5     5     5     5     5     5
  8  CV            13    13    13    13    13    13
  9  AMPHIB         7     7     7     7     7     7
 10  SERVF          3     3     3     3     3     3
 11  CARGRU         8     8     8     8     8     8
 12  TSC            8     8     8     8     8     8
 13  NAVFAC         7     7     7     7     7     7
 14  CRUDGR         6     6     6     6     6     6
 15  PATWING        4     4     4     4     4     4

DISPLAY MORE DATA?
                    ANSWER YES OR NO
YES
```

CURRENT DATA FOR PILOTS CONT.

```
ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
⎕:
      2

                  TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER      1        2        3        4        5

TOUR START       2.0      7.0     12.0     16.5     21.0
TOUR LENGTH      3.0      2.5      2.5      2.0      2.0


DISPLAY MORE DATA?
                        ANSWER YES OR NO
YES


ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
⎕:
      3

                        BILLET REQUIREMENTS

 SEA DUTY                  TOUR POSITIONS
ASSIGNMENTS
                   1       2       3       4       5

  1  VF           31       0       4       1       0
  2  VPSD          0       6       0       0       0
  3  VXE           0       3       1       1       0
  4  VXN           0       2       1       1       0
  5  VC            0       1       1       1       0
  6  VR/VRF        0       4       0       2       0
  7  FEP           0       2       0       0       0
  8  CV            0       3       0       0       0
  9  AMPHIB        0       1       0       0       1
 10  SERVF         0       1       0       0       1
 11  CARGRU        0       1       0       0       0
 12  TSC           0       2       0       1       0
 13  NAVFAC        0       1       0       1       0
 14  CRUDGR        0       0       0       0       0
 15  PATWING       0       0       0       0       1
```

CURRENT DATA FOR PILOTS CONT.

```
                         ANSWER YES OR NO
YES


ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
0!
     4
            1980  1981  1982  1983  1984  1985
YEARS OF
SERVICE
   1          44    44    44    44    44    44
   2         207   244   244   244   244   244
   3         180   205   241   241   241   241
   4         188   175   199   235   235   235
   5         214   150   140   159   187   187
   6         138   136    95    88   100   118
   7          66    85    83    58    54    62
   8          62    51    65    64    45    41
   9          61    57    44    55    55    39
  10          45    42    37    30    38    37
  11          81    38    36    31    26    32
  12          86    73    34    32    29    23
  13          87    81    69    32    30    27
  14          52    68    62    53    26    27
  15          50    39    55    51    43    20
  16          44    49    38    53    49    41
  17          36    41    46    36    50    46
  18          42    35    40    45    35    48
  19          23    37    31    36    40    31
  20          27    19    30    23    20    34
  21          27    18    10    17    14    17
  22          39    18    15    10    17    14
  23          31    36    17    14     9    16
  24          34    29    33    15    12     9
  25          19    29    25    28    13    11
  26          21    17    27    23    26    12
  27           9    17    14    22    18    21
  28           7     7    13    10    16    14
  29           2     5     5    10     8    12
  30           4     2     5     5    10     8

DISPLAY MORE DATA?
                         ANSWER YES OR NO
NO


ALTER ANY DATA?
                         ANSWER YES OR NO
NO
```

RESULTS OF CURRENT DATA FOR PILOTS

```
REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1        744       744       744       744       744       744
  2        120       120       120       120       120       120
  3        101       101       101       101       101       101
  4         41        41        41        41        41        41
  5         12        12        12        12        12        12

VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        582       530       580       635       663       663
  2        146       129       128       134       119        99
  3        126       118       100        59        47        54
  4         72        74        79        81        80        87
  5         70        54        32        24        26        30

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
TOUR
  1      (0.22)    (0.29)    (0.22)    (0.15)    (0.11)    (0.11)
  2       0.82      0.93      0.94      0.90     (0.01)    (0.18)
  3       0.80      0.86     (0.01)    (0.42)    (0.53)    (0.47)
  4       0.57      0.55      0.52      0.50      0.51      0.47
  5       0.17      0.22      0.38      0.50      0.46      0.40
```

CURRENT DATA FOR NFOS

```
DISPLAY DATA BY TYPING                              DISPLAY
ALTER DATA BY TYPING                                CHANGE
FOR DIRECT CALCULATION OF SEA TOURS TYPE            SEATOUR
DISPLAY


PROJECTION OF SEA DUTY ASSIGNMENTS BY TYPE FOR 6 YEARS              ENTER 1
POSITIONS OF TOURS WRT YEARS OF SERVICE                             ENTER 2
BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TOUR           ENTER 3
SUPPLY OF OFFICERS FOR NEXT 6 YEARS BY TIME IN SERVICE              ENTER 4


TYPE NUMBER OF DISPLAY DESIRED
□:
      1


         PROJECTIONS OF SEA DUTY ASSIGNMENTS BY TYPE

                  1980  1981  1982  1983  1984  1985

 SEA DUTY
ASSIGNMENTS


   1  VF           24    24    24    24    24    24
   2  VPSD          2     2     2     2     2     2
   3  VXE           1     1     1     1     1     1
   4  VXN           1     1     1     1     1     1
   5  VC            3     3     3     3     3     3
   6  VR/VRF        3     3     3     3     3     3
   7  FEP           5     5     5     5     5     5
   8  CV           13    13    13    13    13    13
   9  AMPHIB        7     7     7     7     7     7
  10  SERVF         3     3     3     3     3     3
  11  CARGRU        8     8     8     8     8     8
  12  TSC           8     8     8     8     8     8
  13  NAVFAC        7     7     7     7     7     7
  14  CRUDGR        6     6     6     6     6     6
  15  PATWING       4     4     4     4     4     4

DISPLAY MORE DATA?
                    ANSWER YES OR NO
YES
```

CURRENT DATA FOR NFOS CONT.

```
ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
□:
      2

                 TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER     1       2       3       4       5

TOUR START      2.0     7.0    12.0    16.5    21.0
TOUR LENGTH     3.0     2.5     2.5     2.0     2.0



DISPLAY MORE DATA?
                     ANSWER YES OR NO
YES

ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
TYPE NUMBER OF DISPLAY DESIRED
□:
      3

                     BILLET REQUIREMENTS


 SEA DUTY                  TOUR POSITIONS
ASSIGNMENTS
                  1       2       3       4       5

   1  VF         19       0       3       1       0
   2  VFSD        0       3       0       0       0
   3  VXE         0       0       1       0       0
   4  VXN         0       1       1       1       0
   5  VC          0       0       0       1       0
   6  VR/VRF      0       0       0       1       0
   7  FEP         0       1       0       0       0
   8  CV          0       7       0       0       0
   9  AMPHIB      0       1       0       0       0
  10  SERVF       0       0       0       0       0
  11  CARGRU      0       1       0       0       0
  12  TSC         0       6       0       1       0
  13  NAVFAC      0       1       0       1       0
  14  CRUDGR      0       0       0       0       0
  15  PATWING     0       0       0       0       1
```

CURRENT DATA FOR NFOS CONT.

```
  DISPLAY MORE DATA?
                          ANSWER YES OR NO
  YES


  ASSIGNMENTS-1,TOURS-2,BILLETS-3,SUPPLY-4
  TYPE NUMBER OF DISPLAY DESIRED
  0:
        4
          1980   1981   1982   1983   1984   1985
YEARS OF
SERVICE
   1       163    163    163    163    163    163
   2        27    156    156    156    156    156
   3       126     25    150    150    150    150
   4       149    116     23    137    137    137
   5       119    117     89     18    106    106
   6       144     99     98     75     16     89
   7       105    121     84     82     63     12
   8        65     94    109     75     73     56
   9        68     63     90    101     71     73
  10        64     54     47     69     79     55
  11        59     59     49     44     63     73
  12        43     53     53     45     42     61
  13        13     42     51     52     44     41
  14        43     10     34     41     44     43
  15        31     32      8     28     34     34
  16        27     30     32      8     28     34
  17        25     27     29     30      8     27
  18        21     23     25     27     28      8
  19        27     20     23     24     26     28
  20        17     22     15     15     14     21
  21        10     10     12      9     10     10
  22         6      7      9     12      9     10
  23         4      5      6      8     11      8
  24         1      3      5      6      8     10
  25         0      1      3      4      5      6
  26         0      0      1      2      4      5
  27         1      0      0      1      3      3
  28         0      0      0      0      1      1
  29         0      0      0      0      0      1
  30         0      0      0      0      0      0

DISPLAY MORE DATA?
                        ANSWER YES OR NO
NO


ALTER ANY DATA?
                        ANSWER YES OR NO
NO
```

RESULTS OF CURRENT DATA FOR NFOS

```
REQUIREMENTS FOR VP OFFICERS

        1980     1981     1982     1983     1984     1985
TOUR
  1      456      456      456      456      456      456
  2      171      171      171      171      171      171
  3       74       74       74       74       74       74
  4       37       37       37       37       37       37
  5        2        2        2        2        2        2

VP OFFICERS AVAILABLE

        1980     1981     1982     1983     1984     1985
TOUR
  1      394      258      262      305      393      393
  2      165      184      223      211      184      157
  3       45       47       68       73       74       84
  4       47       47       51       54       45       36
  5       10       12       15       20       20       18

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

        1980     1981     1982     1983     1984     1985
TOUR
  1   (0.14)   (0.43)   (0.43)   (0.33)   (0.14)   (0.14)
  2   (0.04)    0.93     0.77     0.81     0.93    (0.08)
  3   (0.39)   (0.36)   (0.08)   (0.01)    1.00     0.88
  4    0.78     0.78     0.72     0.68     0.81    (0.03)
  5    0.20     0.17     0.13     0.10     0.10     0.11
```

APPENDIX G

BILLET REQUIREMENT ALTERATIONS

CHANGE I

(AGGREGATE)

```
THERE ARE SIX(6) MEANS OF CHANGING DATA

TO CHANGE NO, OF SEA DUTY ASSIGNMENTS BY TYPE     ENTER 1
TO CHANGE TOUR POSITION VALUES                    ENTER 2
TO ADD NEW TOUR POSITIONS                         ENTER 3
TO DELETE TOUR POSITIONS                          ENTER 4
TO CHANGE BILLETS BY TOUR POSITION                ENTER 5
TO CHANGE BILLETS BY SEA DUTY ASSIGNMENT          ENTER 6
WHEN YOU ARE FINISHED WITH A CHANGE               ENTER 0

ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      1
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      8
                          CURRENT DATA
             1980     1981     1982     1983     1984     1985
CV            13       13       13       13       13       13

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      13 14 14 14 14 14

DATA ENTERED AS:      13      14      14      14      14      14

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      9
                          CURRENT DATA
             1980     1981     1982     1983     1984     1985
AMPHIB         7        7        7        7        7        7

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      7 8 9 10 10 10
```

CHANGE I CONT.

```
DATA ENTERED AS:      7     8     9     10    10    10

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      10
                        CURRENT DATA
               1980     1981     1982     1983     1984     1985
SERVF           3        3        3        3        3        3

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      3 5 7 7 7 7

DATA ENTERED AS:      3     5     7     7     7     7

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO

DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO


DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE I RESULTS

REQUIREMENTS FOR VP OFFICERS

TOUR	1980	1981	1982	1983	1984	1985
1	1200	1200	1200	1200	1200	1200
2	291	305	309	311	311	311
3	175	175	175	175	175	175
4	77	77	77	77	77	77
5	14	17	20	21	21	21

VP OFFICERS AVAILABLE

TOUR	1980	1981	1982	1983	1984	1985
1	976	788	842	940	1056	1056
2	311	313	350	345	303	255
3	171	165	168	132	121	138
4	119	121	130	135	125	122
5	80	66	47	44	46	48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

TOUR	1980	1981	1982	1983	1984	1985
1	(0.19)	(0.34)	(0.30)	(0.22)	(0.12)	(0.12)
2	0.94	0.97	0.88	0.90	(0.03)	(0.18)
3	(0.02)	(0.06)	(0.04)	(0.25)	(0.31)	(0.21)
4	0.65	0.64	0.59	0.57	0.62	0.63
5	0.18	0.26	0.43	0.48	0.46	0.44

CHANGE II

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      1
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      3
                      CURRENT DATA
              1980    1981    1982    1983    1984    1985
VXE             1       1       1       1       1       1

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      1 0 0 0 0 0

DATA ENTERED AS:      1     0     0     0     0     0

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      4
                      CURRENT DATA
              1980    1981    1982    1983    1984    1985
VXN             1       1       1       1       1       1

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      1 1 0 0 0 0

DATA ENTERED AS:      1     1     0     0     0     0

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      5
                      CURRENT DATA
              1980    1981    1982    1983    1984    1985
VC              3       3       3       3       3       3
```

CHANGE II CONT.

```
ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      2 2 2 2 2 2

DATA ENTERED AS:     2     2     2     2     2     2

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      6
                    CURRENT DATA
            1980    1981    1982    1983    1984    1985
VR/VRF        3       3       3       3       3       3

ENTER NEW DATA FOR ALL YEARS, EVEN IF REPEATED OR ZERO
⎕:
      3 2 1 1 1 1

DATA ENTERED AS:     3     2     1     1     1     1

ENTER NEXT SEA DUTY ASSIGNMENT NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO

DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO

DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE II RESULTS

```
REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1       1200      1200      1200      1200      1200      1200
  2        290       283       276       276       276       276
  3        174       172       170       170       170       170
  4         76        72        68        68        68        68
  5         14        14        14        14        14        14

VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        976       788       842       940      1056      1056
  2        311       313       350       345       303       255
  3        171       165       168       132       121       138
  4        119       121       130       135       125       122
  5         80        66        47        44        46        48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1901      1982      1983      1984      1985
TOUR
  1     (0.19)    (0.34)    (0.30)    (0.22)    (0.12)    (0.12)
  2      0.93      0.90      0.79      0.80      0.91     (0.08)
  3     (0.02)    (0.04)    (0.01)    (0.22)    (0.29)    (0.19)
  4      0.64      0.60      0.53      0.50      0.54      0.56
  5      0.18      0.21      0.30      0.32      0.30      0.29
```

CHANGE III

(PILOTS)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      5
ENTER TOUR NUMBER
⎕:
      2


CURRENT BILLETS ARE

TOUR NO.       VP      VPSD       VNE       VXN       VC   VR/VRF       PEP        CV
       2        0         6         3         2        1        4         2         3


TOUR NO.   AMPHIB     SERVF    CARGRU       TSC   NAVFAC   CRUDGR   PATWING
       2        1         1         1         2        1        0         0


ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      0 6 3 2 1 4 2 6 2 2 2 2 0 1 0

NEW BILLETS ENTERED AS:

TOUR NO.       VP      VPSD       VNE       VXN       VC   VR/VRF       PEP        CV
       2        0         6         3         2        1        4         2         6


TOUR NO.   AMPHIB     SERVF    CARGRU       TSC   NAVFAC   CRUDGR   PATWING
       2        2         2         2         2        0        1         0


ENTER TOUR NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO




DISPLAY ANY DATA?
                    ANSWER YES OR NO
YES
```

CHANGE III CONT.

```
PROJECTION OF SEA DUTY ASSIGNMENTS BY TYPE FOR 6 YEARS             ENTER 1
POSITIONS OF TOURS WRT YEARS OF SERVICE                            ENTER 2
BILLET REQUIREMENTS FOR EACH SEA DUTY ASSIGNMENT PER TOUR          ENTER 3
SUPPLY OF OFFICERS FOR NEXT 6 YEARS BY TIME IN SERVICE             ENTER 4

TYPE NUMBER OF DISPLAY DESIRED
[]:
      3

                 BILLET REQUIREMENTS

 SEA DUTY                  TOUR POSITIONS
ASSIGNMENTS
                1       2       3       4       5

   1  VP       31       0       4       1       0
   2  VFSD      0       6       0       0       0
   3  VXE       0       3       1       1       0
   4  VXN       0       2       1       1       0
   5  VC        0       1       1       1       0
   6  VR/VRF    0       4       0       2       0
   7  FEP       0       2       0       0       0
   8  CV        0       6       0       0       0
   9  AMPHIB    0       2       0       0       1
  10  SERVF     0       2       0       0       1
  11  CARGRU    0       2       0       0       0
  12  TSC       0       2       0       1       0
  13  NAVFAC    0       0       0       1       0
  14  CRUDGR    0       1       0       0       0
  15  PATWIN    0       0       0       0       1

DISPLAY MORE DATA?
                 ANSWER YES OR NO
NQ

ALTER ANY DATA?
                 ANSWER YES OR NO
NO
```

CHANGE III RESULTS

REQUIREMENTS FOR VP OFFICERS

TOUR	1980	1981	1982	1983	1984	1985
1	744	744	744	744	744	744
2	178	178	178	178	178	178
3	101	101	101	101	101	101
4	41	41	41	41	41	41
5	12	12	12	12	12	12

VP OFFICERS AVAILABLE

TOUR	1980	1981	1982	1983	1984	1985
1	582	530	580	635	663	663
2	146	129	128	134	119	99
3	126	118	100	59	47	54
4	72	74	79	81	80	87
5	70	54	32	24	26	30

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

TOUR	1980	1981	1982	1983	1984	1985
1	(0.22)	(0.29)	(0.22)	(0.15)	(0.11)	(0.11)
2	(0.18)	(0.28)	(0.28)	(0.25)	(0.33)	(0.45)
3	0.80	0.86	(0.01)	(0.42)	(0.53)	(0.47)
4	0.57	0.55	0.52	0.50	0.51	0.47
5	0.17	0.22	0.38	0.50	0.46	0.40

CHANGE IV

(PILOTS)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
D:
      5
ENTER TOUR NUMBER
D:
      2


CURRENT BILLETS ARE

TOUR NO.        VP      VPSD      VXE      VXN      VC   VR/VRF      PEP      CV
      2          0         6        3        2       1        4        2       3

TOUR NO.    AMPHIB     SERVF   CARGRU      TSC   NAVFAC  CRUDGR  PATWING
      2          1         1        1        2       1        0        0

ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
D:
      0 6 1 1 0 1 1 1 0 0 0 1 0 0 0

NEW BILLETS ENTERED AS:

TOUR NO.        VP      VPSD      VXE      VXN      VC   VR/VRF      PEP      CV
      2          0         6        1        1       0        1        1       1

TOUR NO.    AMPHIB     SERVF   CARGRU      TSC   NAVFAC  CRUDGR  PATWING
      2          0         0        0        1       0        0        0

ENTER TOUR NUMBER
D:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO



DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE IV RESULTS

REQUIREMENTS FOR VP OFFICERS

TOUR	1980	1981	1982	1983	1984	1985
1	744	744	744	744	744	744
2	43	43	43	43	43	43
3	101	101	101	101	101	101
4	41	41	41	41	41	41
5	12	12	12	12	12	12

VP OFFICERS AVAILABLE

TOUR	1980	1981	1982	1983	1984	1985
1	582	530	580	635	663	663
2	146	129	128	134	119	99
3	126	118	100	59	47	54
4	72	74	79	81	80	87
5	70	54	32	24	26	30

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

TOUR	1980	1981	1982	1983	1984	1985
1	(0.22)	(0.29)	(0.22)	(0.15)	(0.11)	(0.11)
2	0.30	0.33	0.34	0.32	0.36	0.44
3	0.80	0.86	(0.01)	(0.42)	(0.53)	(0.47)
4	0.57	0.55	0.52	0.50	0.51	0.47
5	0.17	0.22	0.38	0.50	0.46	0.40

CHANGE V

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
□:
      6
ENTER SHIP TYPE NUMBER
□:
      1
                                    VP
                             CURRENT   BILLETS


TOUR NO          1         2         3         4         5
BILLETS         50         0         7         2         0


ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO
□:
      40 0 4 2 0
                                  VP
                             NEW   BILLETS

ENTERED AS:        40         0         4         2         0


ENTER SHIP TYPE NUMBER
□:
      0
ALTER MORE DATA?
                             ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                             ANSWER YES OR NO
NO




DISPLAY ANY DATA?
                             ANSWER YES OR NO
NO
```

CHANGE V RESULTS

REQUIREMENTS FOR VP OFFICERS

TOUR	1980	1981	1982	1983	1984	1985
1	960	960	960	960	960	960
2	291	291	291	291	291	291
3	103	103	103	103	103	103
4	77	77	77	77	77	77
5	14	14	14	14	14	14

VP OFFICERS AVAILABLE

TOUR	1980	1981	1982	1983	1984	1985
1	976	788	842	940	1056	1056
2	311	313	350	345	303	255
3	171	165	168	132	121	138
4	119	121	130	135	125	122
5	80	66	47	44	46	48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

TOUR	1980	1981	1982	1983	1984	1985
1	0.98	(0.18)	(0.12)	(0.02)	0.91	0.91
2	0.94	0.93	0.83	0.84	0.96	(0.12)
3	0.60	0.62	0.61	0.78	0.85	0.75
4	0.65	0.64	0.59	0.57	0.62	0.63
5	0.18	0.21	0.30	0.32	0.30	0.29

APPENDIX H

TOUR POSITION ALTERATIONS

CHANGE VI

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2

YOUR CURRENT TOUR POSITION MATRIX IS;
                TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER     1       2       3       4       5

TOUR START      2.0     7.0     12.0    16.5    21.0
TOUR LENGTH     3.0     2.5      2.5     2.0     2.0

ENTER TOUR NUMBER TO BE CHANGED
⎕:
      4

ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER    4
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      16.5 3.0

YOUR VALUES ENTERED AS;
TOUR NUMBER        START       LENGTH
     4              16.5           3


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      0
ALTER MORE DATA?
                          ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                          ANSWER YES OR NO
NO

DISPLAY ANY DATA?
                          ANSWER YES OR NO
NO
```

CHANGE VI RESULTS

```
REQUIREMENTS FOR VP OFFICERS

         1980      1981      1982      1983      1984      1985
TOUR
  1      1200      1200      1200      1200      1200      1200
  2       291       291       291       291       291       291
  3       175       175       175       175       175       175
  4        77        77        77        77        77        77
  5        14        14        14        14        14        14

VP OFFICERS AVAILABLE

         1980      1981      1982      1983      1984      1985
TOUR
  1       976       788       842       940      1056      1056
  2       311       313       350       345       303       255
  3       171       165       168       132       121       138
  4       166       170       177       179       163       179
  5        80        66        47        44        46        48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

         1980      1981      1982      1983      1984      1985
TOUR
  1     (0.19)    (0.34)    (0.30)    (0.22)    (0.12)    (0.12)
  2      0.94      0.93      0.83      0.84      0.96     (0.12)
  3     (0.02)    (0.06)    (0.04)    (0.25)    (0.31)    (0.21)
  4      0.47      0.45      0.44      0.43      0.47      0.43
  5      0.18      0.21      0.30      0.32      0.30      0.29
```

CHANGE VII

(PILOTS)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2

YOUR CURRENT TOUR POSITION MATRIX IS:
              TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER    1      2      3      4      5

TOUR START     2.0    7.0   12.0   16.5   21.0
TOUR LENGTH    3.0    2.5    2.5    2.0    2.0

ENTER TOUR NUMBER TO BE CHANGED
⎕:
      3

ENTER NEW VALUES FOR TOUR START AND LENGTH
         FOR TOUR NUMBER    3
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      11.0 3.0

YOUR VALUES ENTERED AS:
TOUR NUMBER      START      LENGTH
     3             11          3



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      1

ENTER NEW VALUES FOR TOUR START AND LENGTH
         FOR TOUR NUMBER    1
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      2.0 4.0

YOUR VALUES ENTERED AS:
TOUR NUMBER      START      LENGTH
     1             2          4
```

CHANGE VII RESULTS

```
ENTER TOUR NUMBER TO BE CHANGED
□:
      0
ALTER MORE DATA?
                         ANSWER YES OR NO
NO

DO YOU WANT ALL CHANGES MADE PERMANENT?
                         ANSWER YES OR NO
NO

DISPLAY ANY DATA?
                         ANSWER YES OR NO
NO

REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1        744       744       744       744       744       744
  2        120       120       120       120       120       120
  3        101       101       101       101       101       101
  4         41        41        41        41        41        41
  5         12        12        12        12        12        12


VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        720       666       675       723       763       781
  2        146       129       128       134       119        99
  3        212       191       134        91        76        77
  4         72        74        79        81        80        87
  5         70        54        32        24        26        30

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED


VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
TOUR
  1      (0.03)    (0.10)    (0.09)    (0.03)     0.98      0.95
  2       0.82      0.93      0.94      0.90     (0.01)    (0.18)
  3       0.48      0.53      0.75     (0.10)    (0.25)    (0.24)
  4       0.57      0.55      0.52      0.50      0.51      0.47
  5       0.17      0.22      0.38      0.50      0.46      0.40
```

CHANGE VIII

(NFOS)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2

YOUR CURRENT TOUR POSITION MATRIX IS;
                TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER     1       2       3       4       5

TOUR START      2.0     7.0    12.0    16.5    21.0
TOUR LENGTH     3.0     2.5     2.5     2.0     2.0


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      1

ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     1
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      2.0  4.0

YOUR VALUES ENTERED AS;
TOUR NUMBER        START       LENGTH
     1               2           4



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      3

ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     3
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      11.0 3.0

YOUR VALUES ENTERED AS;
TOUR NUMBER        START       LENGTH
     3               11          3
```

CHANGE VIII RESULTS

```
ENTER TOUR NUMBER TO BE CHANGED
O:
     0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO

DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO

 REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
 TOUR
   1       456       456       456       456       456       456
   2       171       171       171       171       171       171
   3        74        74        74        74        74        74
   4        37        37        37        37        37        37
   5         2         2         2         2         2         2


 VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
 TOUR
   1       538       357       360       380       409       482
   2       165       184       223       211       184       157
   3        88       100       121       118       116       145
   4        47        47        51        54        45        36
   5        10        12        15        20        20        18


 NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
 PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED


 VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
 TOUR
   1      0.85    (0.22)    (0.21)    (0.17)    (0.10)      0.95
   2    (0.04)      0.93      0.77      0.81      0.93    (0.08)
   3      0.84      0.74      0.61      0.63      0.64      0.51
   4      0.78      0.78      0.72      0.68      0.81    (0.03)
   5      0.20      0.17      0.13      0.10      0.10      0.11
```

CHANGE IX

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      3

YOUR CURRENT TOUR MATRIX IS;


               TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER    1      2      3      4      5

TOUR START     2.0    7.0   12.0   16.5   21.0
TOUR LENGTH    3.0    2.5    2.5    2.0    2.0


ENTER CURRENT TOUR NUMBERS
      YOU WANT FOLLOWED BY NEW TOURS
IF YOU WANT TO ADD MORE THAN ONE TOUR BETWEEN ANY TWO CURRENT TOURS
JUST REPEAT THE NUMBER ENTERED AS MANY TIMES AS THE NUMBER OF TOURS
YOU WANT INSERTED
⎕:
      2


TOUR POSITIONS REVISED TO;


               TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER    1      2      3      4      5      6

TOUR START     2.0    7.0          12.0   16.5   21.0
TOUR LENGTH    3.0    2.5           2.5    2.0    2.0


TOUR START AND LENGTH MUST NOW BE ADDED TO NEW TOURS



ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     3
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      9.5 2.5
```

CHANGE IX CONT.

```
TOUR VALUES ENTERED AS:
TOUR NUMBER       START      LENGTH
     3              9.5         2.5



BILLETS MUST BE ADDED FOR NEW TOURS




CURRENT BILLETS ARE

TOUR NO.         VP       VPSD       VXE        VXN        VC   VR/VRF        FEP         CV
       3          0          0         0          0         0        0          0          0

TOUR NO.    AMPHIB      SERVF    CARGRU        TSC     NAVFAC    CRUDGR   FATWING
       3          0          0         0          0         0        0          0

ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
0:

      5 0 0 0 0 0 0 0 0 0 0 0 0 0 0
NEW BILLETS ENTERED AS:

TOUR NO.         VP       VPSD       VXE        VXN        VC   VR/VRF        FEP         CV
       3          5          0         0          0         0        0          0          0

TOUR NO.    AMPHIB      SERVF    CARGRU        TSC     NAVFAC    CRUDGR   FATWING
       3          0          0         0          0         0        0          0

ALTER MORE DATA?
                    ANSWER YES OR NO
YES
```

CHANGE IX CONT.

```
1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
       6
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
       1
                        VP
                   CURRENT  BILLETS


TOUR NO       1        2        3        4        5        6
BILLETS      50        0        5        7        2        0


ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO
⎕:
       45 0 5 7 2 0
                      VP
                   NEW  BILLETS

ENTERED AS:      45       0        5        7        2        0


ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
       0
ALTER MORE DATA?
                   ANSWER YES OR NO
NO
DO YOU WANT ALL CHANGES MADE PERMANENT?
                   ANSWER YES OR NO
NO




DISPLAY ANY DATA?
                   ANSWER YES OR NO
NO
```

CHANGE IX RESULTS

```
REQUIREMENTS FOR VP OFFICERS

         1980      1981      1982      1983      1984      1985
TOUR
  1      1080      1080      1080      1080      1080      1080
  2       291       291       291       291       291       291
  3       120       120       120       120       120       120
  4       175       175       175       175       175       175
  5        77        77        77        77        77        77
  6        14        14        14        14        14        14

VP OFFICERS AVAILABLE

         1980      1981      1982      1983      1984      1985
TOUR
  1       976       788       842       940      1056      1056
  2       311       313       350       345       303       255
  3       317       250       211       202       219       235
  4       171       165       168       132       121       138
  5       119       121       130       135       125       122
  6        80        66        47        44        46        48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

         1980      1981      1982      1983      1984      1985
TOUR
  1     (0.10)    (0.27)    (0.22)    (0.13)    (0.02)    (0.02)
  2      0.94      0.93      0.83      0.84      0.96     (0.12)
  3      0.38      0.48      0.57      0.60      0.55      0.51
  4     (0.02)    (0.06)    (0.04)    (0.25)    (0.31)    (0.21)
  5      0.65      0.64      0.59      0.57      0.62      0.63
  6      0.18      0.21      0.30      0.32      0.30      0.29
```

CHANGE X

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2

YOUR CURRENT TOUR POSITION MATRIX IS:
               TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER     1       2       3       4       5

TOUR START      2.0     7.0     12.0    16.5    21.0
TOUR LENGTH     3.0     2.5      2.5     2.0     2.0


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      4


ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     4
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      14.5 1.5


YOUR VALUES ENTERED AS:
TOUR NUMBER      START       LENGTH
     4             14.5          1.5



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      3
```

CHANGE X CONT.

```
YOUR CURRENT TOUR MATRIX IS:


                   TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER        1        2        3        4        5

TOUR START         2.0      7.0     12.0     14.5     21.0
TOUR LENGTH        3.0      2.5      2.5      1.5      2.0

ENTER CURRENT TOUR NUMBERS
        YOU WANT FOLLOWED BY NEW TOURS
IF YOU WANT TO ADD MORE THAN ONE TOUR BETWEEN ANY TWO CURRENT TOURS
JUST REPEAT THE NUMBER ENTERED AS MANY TIMES AS THE NUMBER OF TOURS
YOU WANT INSERTED
⎕:
        4


TOUR POSITIONS REVISED TO:


                   TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER        1        2        3        4        5        6

TOUR START         2.0      7.0     12.0     14.5              21.0
TOUR LENGTH        3.0      2.5      2.5      1.5               2.0

TOUR START AND LENGTH MUST NOW BE ADDED TO NEW TOURS




ENTER NEW VALUES FOR TOUR START AND LENGTH
             FOR TOUR NUMBER     5
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
        17.0 1.5

YOUR VALUES ENTERED AS:
TOUR NUMBER      START      LENGTH
      5            17          1.5
```

CHANGE X CONT.

```
BILLETS MUST BE ADDED FOR NEW TOURS



CURRENT BILLETS ARE

TOUR NO.        VP      VFSD       VXE       VXN        VC   VR/VRF       PEP       CV
       5         0         0         0         0         0        0         0        0


TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC   CRUDGR   PATWING
       5         0         0         0         0         0        0         0

ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      1 0 1 1 1 1 0 0 0 0 0 1 0 0 0
NEW BILLETS ENTERED AS:

TOUR NO.        VP      VFSD       VXE       VXN        VC   VR/VRF       PEP       CV
       5         1         0         1         1         1        1         0        0


TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC   CRUDGR   PATWING
       5         0         0         0         1         0        0         0


ALTER MORE DATA?
                    ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      5
ENTER TOUR NUMBER
⎕:
      4
```

CHANGE X CONT.

```
CURRENT BILLETS ARE

TOUR NO.         VP      VPSD       VXE       VXN        VC    VR/VRF       PEP        CV
       4          2         0         1         1         1         3         0         0

TOUR NO.     AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       4          0         0         0         1         1         0         0

ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      1 0 1 1 1 1 0 0 0 0 0 0 1 0 0
NEW BILLETS ENTERED AS:

TOUR NO.         VP      VPSD       VXE       VXN        VC    VR/VRF       PEP        CV
       4          1         0         1         1         1         1         0         0

TOUR NO.     AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       4          0         0         0         0         1         0         0

ENTER TOUR NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO




DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE X RESULTS

```
REQUIREMENTS FOR VP OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1       1200      1200      1200      1200      1200      1200
  2        291       291       291       291       291       291
  3        175       175       175       175       175       175
  4         39        39        39        39        39        39
  5         40        40        40        40        40        40
  6         14        14        14        14        14        14

VP OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        976       788       842       940      1056      1056
  2        311       313       350       345       303       255
  3        171       165       168       132       121       138
  4        112       115       102       101       116       102
  5         88        87        92       102        96        86
  6         80        66        47        44        46        48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
TOUR
  1     (0.19)    (0.34)    (0.30)    (0.22)    (0.12)    (0.12)
  2      0.94      0.93      0.83      0.84      0.96     (0.12)
  3     (0.02)    (0.06)    (0.04)    (0.25)    (0.31)    (0.21)
  4      0.35      0.34      0.38      0.39      0.34      0.38
  5      0.45      0.46      0.43      0.39      0.42      0.47
  6      0.18      0.21      0.30      0.32      0.30      0.29
```

APPENDIX I

COMBINED ALTERATIONS

CHANGE XI

(PILOTS)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2


YOUR CURRENT TOUR POSITION MATRIX IS:
                 TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER      1        2        3        4        5

TOUR START       2.0      7.0     12.0     16.5     21.0
TOUR LENGTH      3.0      2.5      2.5      2.0      2.0


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      1


ENTER NEW VALUES FOR TOUR START AND LENGTH
            FOR TOUR NUMBER      1
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      2.0 4.0


YOUR VALUES ENTERED AS:
TOUR NUMBER       START       LENGTH
     1              2            4




ENTER TOUR NUMBER TO BE CHANGED
⎕:
      3


ENTER NEW VALUES FOR TOUR START AND LENGTH
            FOR TOUR NUMBER      3
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      11.0 3.0


YOUR VALUES ENTERED AS:
TOUR NUMBER       START       LENGTH
     3              11           3
```

CHANGE XI CONT.

```
ENTER TOUR NUMBER TO BE CHANGED
⎕:
      0
ALTER MORE DATA?
                         ANSWER YES OR NO
YES

1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
      5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      5
ENTER TOUR NUMBER
⎕:
      2

CURRENT BILLETS ARE

TOUR NO.        VP      VPSD      VXE       VXN        VC    VR/VRF       PEP        CV
       2         0         6        3         2         1         4         2         3

TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       2         1         1         1         2         1         0         0

ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      3 6 1 0 0 0 1 1 0 0 0 1 0 0 0

NEW BILLETS ENTERED AS;

TOUR NO.        VP      VFSD      VXE       VXN        VC    VR/VRF       FEP        CV
       2         3         6        1         0         0         0         1         1

TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       2         0         0         0         1         0         0         0

ENTER TOUR NUMBER
⎕:
      0
ALTER MORE DATA?
                         ANSWER YES OR NO
YES
```

CHANGE XI CONT.

```
1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      6
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      1
                         VP
                    CURRENT  BILLETS


TOUR NO        1        2        3        4        5
BILLETS       31        3        4        1        0


ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO
⎕:
      28 3 3 1 0
                      VP
                    NEW  BILLETS

ENTERED AS:       28        3        3        1        0


ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO




DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE XI RESULTS

```
REQUIREMENTS FOR VF OFFICERS

        1980     1981     1982     1983     1984     1985
TOUR
  1      672      672      672      672      672      672
  2      111      111      111      111      111      111
  3       77       77       77       77       77       77
  4       41       41       41       41       41       41
  5       12       12       12       12       12       12

VF OFFICERS AVAILABLE

        1980     1981     1982     1983     1984     1985
TOUR
  1      720      666      675      723      763      781
  2      146      129      128      134      119       99
  3      212      191      134       91       76       77
  4       72       74       79       81       80       87
  5       70       54       32       24       26       30

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VF SEATOUR OPPORTUNITIES OR SHORTFALLS

        1980     1981     1982     1983     1984     1985
TOUR
  1     0.93    (0.01)    1.00     0.93     0.88     0.86
  2     0.76     0.86     0.87     0.83     0.93    (0.11)
  3     0.36     0.40     0.57     0.85    (0.01)    1.00
  4     0.57     0.55     0.52     0.50     0.51     0.47
  5     0.17     0.22     0.38     0.50     0.46     0.40
```

CHANGE XII

(NFOS)

```
ENTER THE NUMBER THAT CORRESPONDS TO TOUR DESIRED CHANGE
⎕:
      6
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      1
                              VP
                         CURRENT  BILLETS


TOUR NO        1        2        3        4        5
BILLETS       19        0        3        1        0


ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO
⎕:
      16 3 2 1 0
                            VP
                         NEW  BILLETS

ENTERED AS:      16        3        2        1        0


ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      0
ALTER MORE DATA?
                         ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      5
ENTER TOUR NUMBER
⎕:
      2


CURRENT BILLETS ARE

TOUR NO.         VP       VPSD        VXE        VXN         VC     VR/VRF        FEP         CV
      2           3          3          0          1          0          0          1          7

TOUR NO.     AMPHIB      SERVF     CARGRU        TSC     NAVFAC     CRUDGR     PATWING
      2           1          0          1          6          1          0          0
```

CHANGE XII CONT.

```
ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      3 1 0 0 0 0 1 3 0 0 0 5 0 0 0

NEW BILLETS ENTERED AS;

TOUR NO.        VP      VPSD       VXE       VXN        VC    VR/VRF       PEP         CV
       2         3         1         0         0         0         0         1          3


TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       2         0         0         0         5         0         0         0


ENTER TOUR NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2


YOUR CURRENT TOUR POSITION MATRIX IS;
               TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER    1       2       3       4       5

TOUR START     2.0     7.0    12.0    16.5    21.0
TOUR LENGTH    3.0     2.5     2.5     2.0     2.0


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      1
```

CHANGE XII CONT.

```
ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER    1
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      2.0 4.0

YOUR VALUES ENTERED AS:
TOUR NUMBER      START      LENGTH
     1             2          4



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      3

ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER    3
BE SURE AND PUT A SFACE BETWEEN THE TWO NUMBERS
⎕:
      11.0 3.0

YOUR VALUES ENTERED AS:
TOUR NUMBER      START      LENGTH
     3             11         3



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO

DO YOU WANT ALL CHANGES MADE FERMANENT?
                    ANSWER YES OR NO
NO



DISFLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE XII RESULTS

```
REQUIREMENTS FOR VF OFFICERS

          1980      1981      1982      1983      1984      1985
TOUR
  1        384       384       384       384       384       384
  2        158       158       158       158       158       158
  3         50        50        50        50        50        50
  4         37        37        37        37        37        37
  5          2         2         2         2         2         2

VF OFFICERS AVAILABLE

          1980      1981      1982      1983      1984      1985
TOUR
  1        538       357       360       380       409       482
  2        165       184       223       211       184       157
  3         88       100       121       118       116       145
  4         47        47        51        54        45        36
  5         10        12        15        20        20        18

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VF SEATOUR OPPORTUNITIES OR SHORTFALLS

          1980      1981      1982      1983      1984      1985
TOUR
  1       0.71    (0.07)    (0.06)    (0.01)     0.94      0.80
  2       0.96     0.86      0.71      0.75      0.86    (0.01)
  3       0.57     0.50      0.41      0.42      0.43      0.34
  4       0.78     0.78      0.72      0.68      0.81    (0.03)
  5       0.20     0.17      0.13      0.10      0.10      0.11
```

CHANGE XIII

(AGGREGATE)

```
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      6
ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      1
                          VP
                    CURRENT  BILLETS


TOUR NO        1        2        3        4        5
BILLETS       50        0        7        2        0


ENTER NEW BILLETS FOR ALL TOURS, EVEN IF REPEATED OR ZERO
⎕:
      42 0 5 2 0
                        VP
                    NEW  BILLETS

ENTERED AS:         42        0        5        2        0


ENTER SEA DUTY ASSIGNMENT NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      5
ENTER TOUR NUMBER
⎕:
      2


CURRENT BILLETS ARE

TOUR NO.         VP      VFSD       VXE       VXN        VC    VR/VRF       FEP        CV
       2          0         9         3         3         1         4         3        10

TOUR NO.     AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       2          2         1         2         8         1         1         0
```

CHANGE XIII CONT.

```
ENTER THE CHANGE IN NO. OF BILLETS ASSIGNED TO EACH SEA DUTY ASSIGNMENT
BE SURE TO ENTER A NUMBER FOR ALL SEA DUTY ASSIGNMENTS EVEN IF REPEATED OR ZERO
⎕:
      5 8 1 1 0 0 2 5 1 0 1 6 0 0 0

NEW BILLETS ENTERED AS:

TOUR NO.        VP      VFSD       VXE       VXN        VC    VR/VRF       FEP        CV
       2         5         8         1         1         0         0         2         5


TOUR NO.    AMPHIB     SERVF    CARGRU       TSC    NAVFAC    CRUDGR   PATWING
       2         1         0         1         6         0         0         0


ENTER TOUR NUMBER
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
YES


1-ASSIGNMENTS / 2-TOUR POSITIONS / 3-ADD TOURS / 4-DELETE TOURS
     5-BILLETS BY TOUR / 6-BILLETS BY SEA DUTY ASSIGNMENT
ENTER THE NUMBER THAT CORRESPONDS TO YOUR DESIRED CHANGE
⎕:
      2


YOUR CURRENT TOUR POSITION MATRIX IS:
               TOUR POSITIONS WRT YEARS OF SERVICE

TOUR NUMBER    1      2      3      4      5

TOUR START     2.0    7.0   12.0   16.5   21.0
TOUR LENGTH    3.0    2.5    2.5    2.0    2.0


ENTER TOUR NUMBER TO BE CHANGED
⎕:
      1


ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     1
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      2.0 4.0
```

CHANGE XIII CONT.

```
YOUR VALUES ENTERED AS:
TOUR NUMBER       START      LENGTH
     1              2          4



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      3

ENTER NEW VALUES FOR TOUR START AND LENGTH
          FOR TOUR NUMBER     3
BE SURE AND PUT A SPACE BETWEEN THE TWO NUMBERS
⎕:
      11.0 3.0

YOUR VALUES ENTERED AS:
TOUR NUMBER       START      LENGTH
     3              11         3



ENTER TOUR NUMBER TO BE CHANGED
⎕:
      0
ALTER MORE DATA?
                    ANSWER YES OR NO
NO


DO YOU WANT ALL CHANGES MADE PERMANENT?
                    ANSWER YES OR NO
NO



DISPLAY ANY DATA?
                    ANSWER YES OR NO
NO
```

CHANGE XIII RESULTS

REQUIREMENTS FOR VP OFFICERS

TOUR	1980	1981	1982	1983	1984	1985
1	1008	1008	1008	1008	1008	1008
2	276	276	276	276	276	276
3	127	127	127	127	127	127
4	77	77	77	77	77	77
5	14	14	14	14	14	14

VP OFFICERS AVAILABLE

TOUR	1980	1981	1982	1983	1984	1985
1	1258	1023	1035	1103	1172	1263
2	311	313	350	345	303	255
3	300	291	255	209	192	222
4	119	121	130	135	125	122
5	80	66	47	44	46	48

NORMAL OUTPUT - OFFICERS CHANCE OF AN ASSIGNMENT TO A SEATOUR
PARENTHETICAL OUTPUT - PERCENTAGE TOUR IS UNDERMANNED

VP SEATOUR OPPORTUNITIES OR SHORTFALLS

TOUR	1980	1981	1982	1983	1984	1985
1	0.80	0.99	0.97	0.91	0.86	0.80
2	0.89	0.88	0.79	0.80	0.91	(0.08)
3	0.42	0.44	0.50	0.61	0.66	0.57
4	0.65	0.64	0.59	0.57	0.62	0.63
5	0.18	0.21	0.30	0.32	0.30	0.29

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